Vol. XLVI DECEMBER 28th, 1944

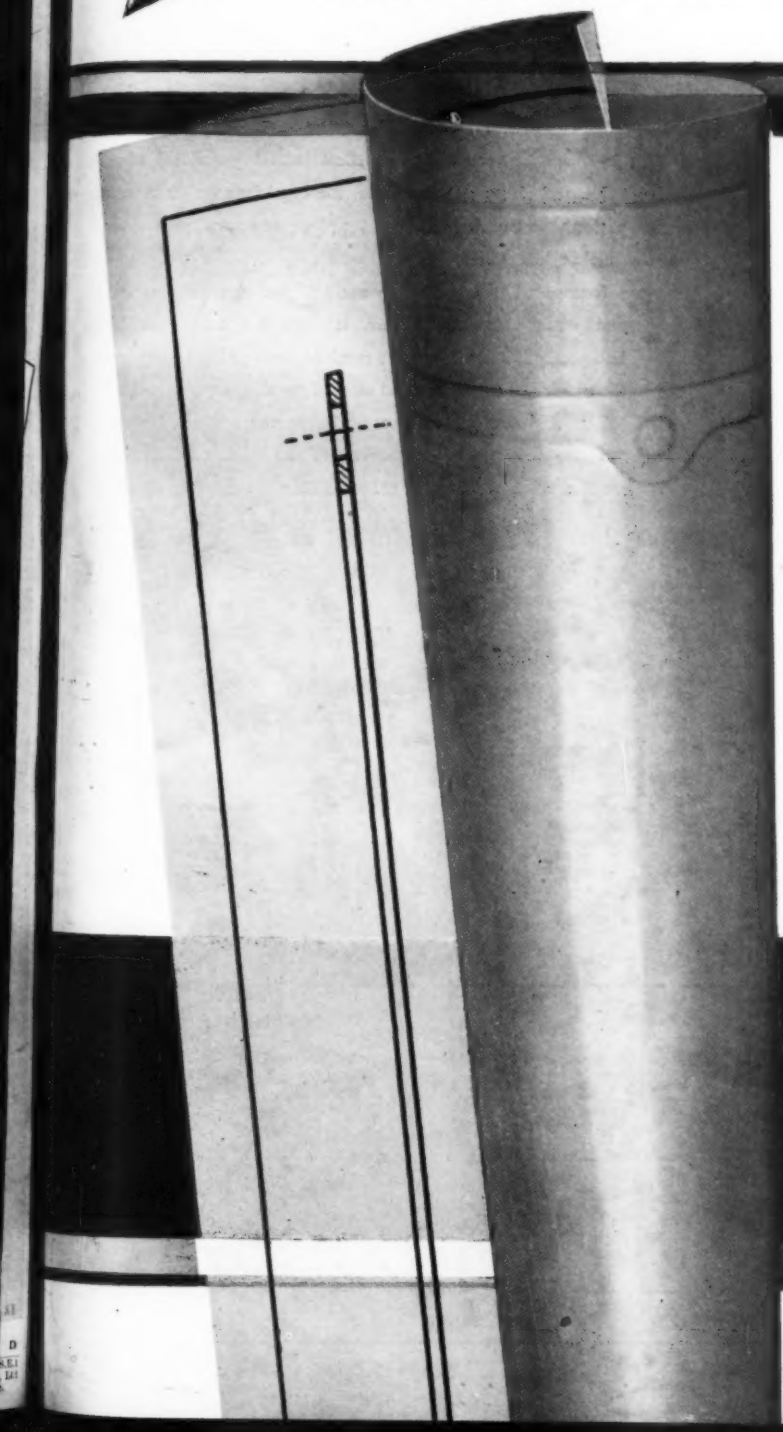
Technical Information Section
Bureau of Aeronautics

FLIGHT

and

AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB ONE SHILLING



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Another of those washers, this time drawn in section, known as 'Langite.'

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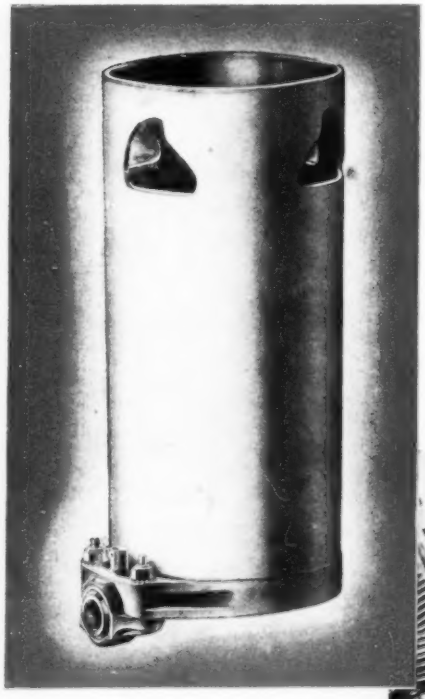
Advantages of the simple sleeve-valve . . . No. 11.

Improved Breathing Qualities . . .



ON "Bristol" engines all the advantages of a cool exhaust are achieved by the excellent breathing qualities of the cylindrical sleeve. Furthermore, the combustion chambers are perfectly symmetrical and sparking plugs are centralised in a very simple cylinder head.

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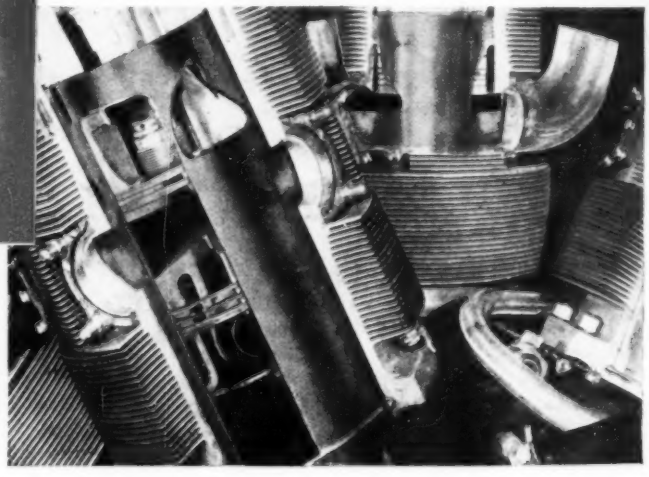
This not only ensures improved economy and more power, but also reduces the temperature of the exhaust system. No wonder "Bristol" engines are so reliable.

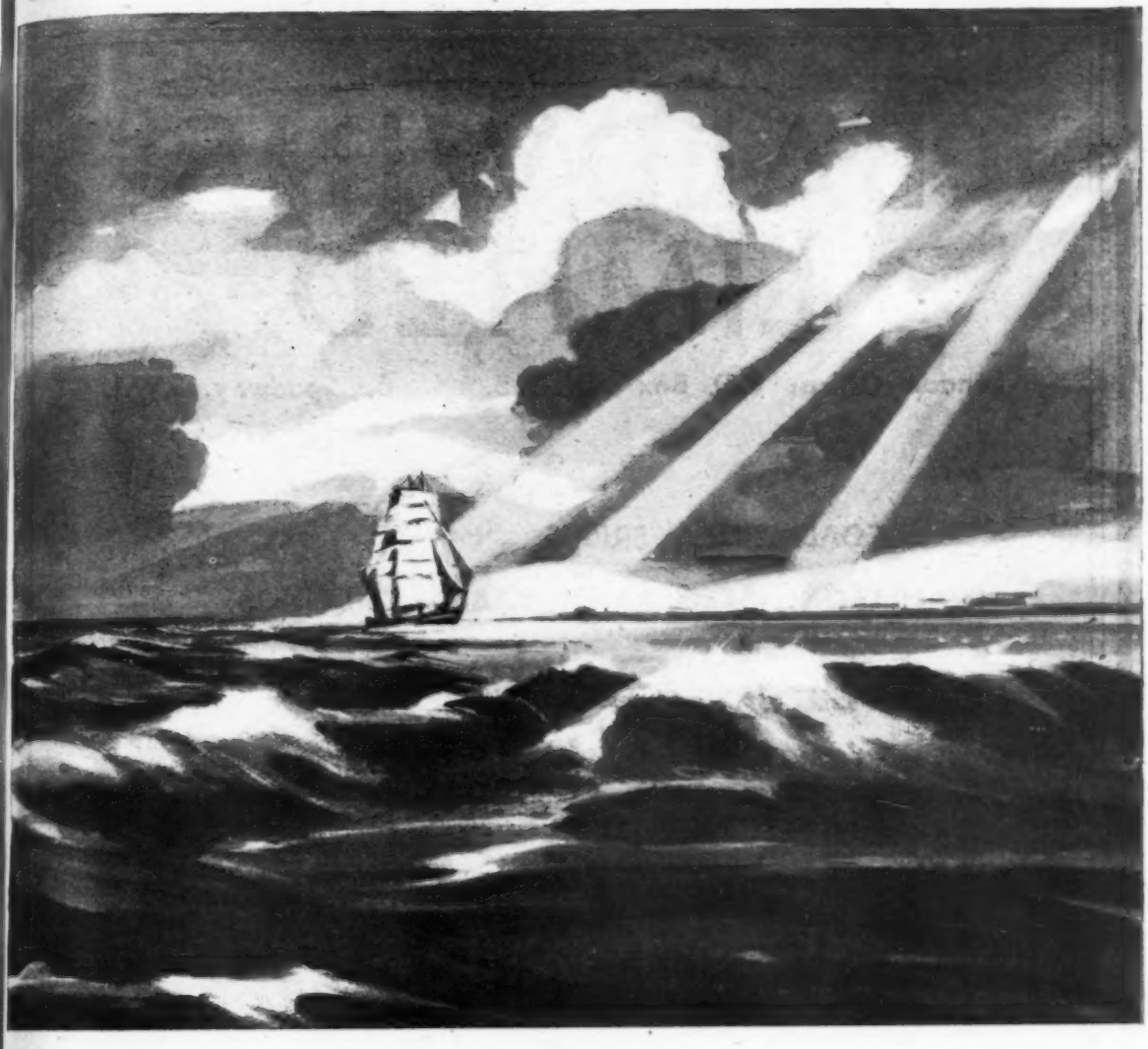


This is one of a series of twelve advertisements prepared for retention, and constitutes a simple story of sleeve-valve advantages. Previous copies are available on request to the Bristol Aeroplane Company Ltd., Bristol.

Perseus, Taurus, Hercules, **SLEEVE-VALVE** *Engines*

Bristol pioneered and developed the single sleeve-valve engine

544 E



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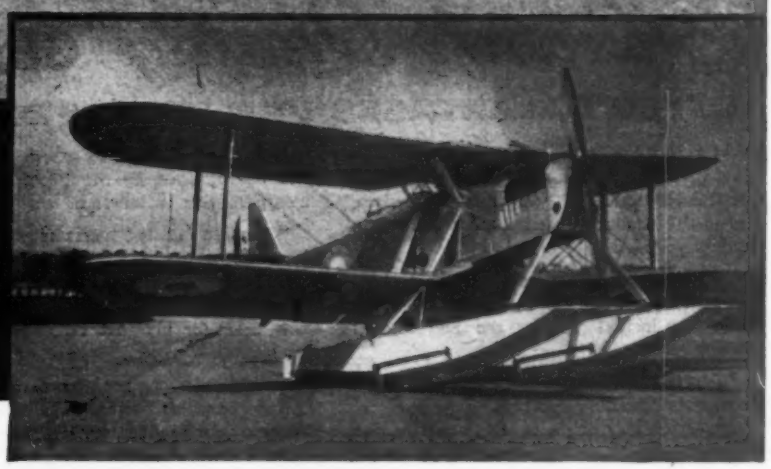
BALDWINS

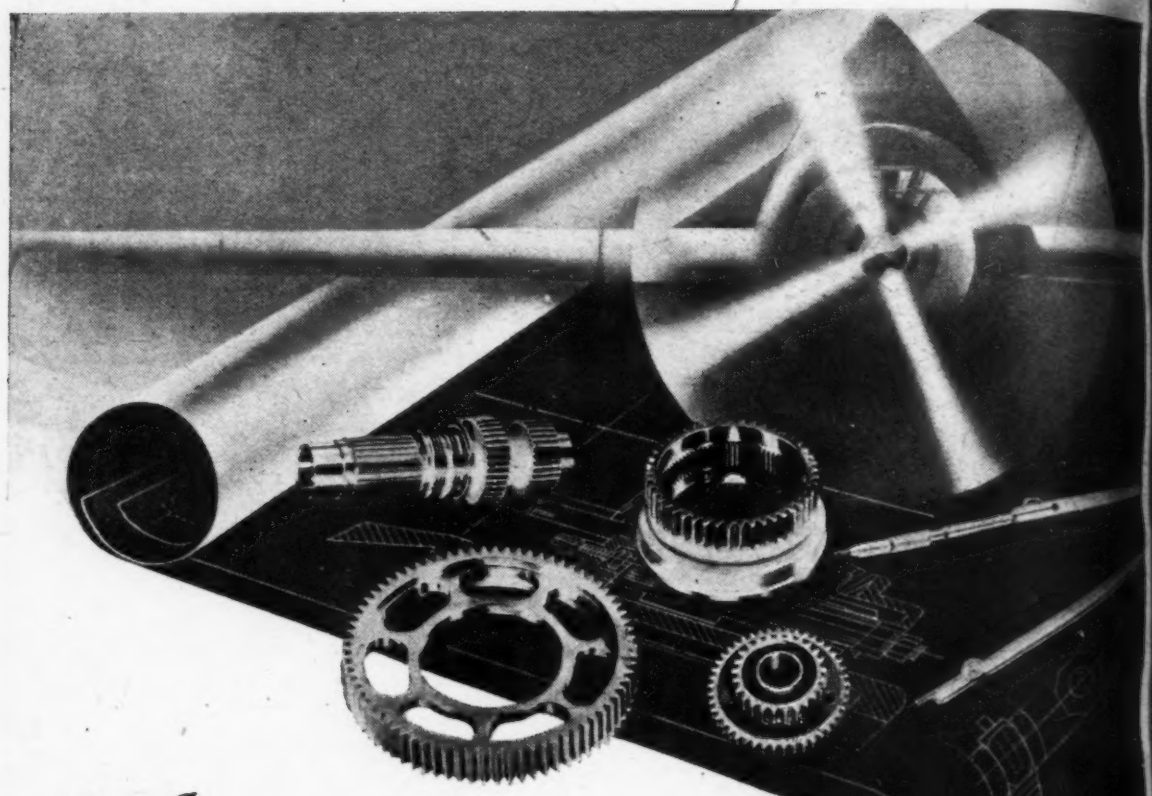
Recollections of the FLEET AIR ARM

The Blackburn "RIPON" 1926



The first "Ripons" were of wooden construction, but by 1928 the metal "Ripon," which was to supersede the Blackburn "Dart" as the standard torpedo bomber of the Fleet Air Arm, was developed. The "Ripon" was a single bay biplane with a 570 h.p. Napier Lion XI engine. It was capable of a top speed of about 130 m.p.h. and had an absolute ceiling of 15,000ft. It was a two-seater, and carried two machine guns; as alternative to its torpedo a bomb load of 1,000 lb. could be carried. A seaplane version was built, but the Fleet Air Arm used the "Ripon" mainly as a deck-landing machine. The "Ripon" was the forerunner of the T.S.R. type, and had extra tankage capacity for long-range reconnaissance. Types derived from the "Ripon" were the "Beagle" (Jupiter VIII) and the "Baffin" (Pegasus). Span, 45ft. 7½in. Length overall, 36ft. 9in. Wing area, 650 sq. ft. Weight, 7,405 lb. Service ceiling, 10,000ft. Endurance, 3½ hrs. at 109 m.p.h.

Blackburn AIRCRAFT



"Aircraft Quality" GEARS

OFFER ADVANTAGES FOR YOUR PRODUCT

War urgency demands the seemingly impossible of men and machines. Before the war the "aircraft quality" gears that Foote Bros. are to-day producing were hardly more than an engineer's ideal.

To-day these gears, closely approaching theoretical perfection, are flowing off Foote Bros.' production line by the hundreds of thousands.

"Aircraft quality" gears were developed to meet the exacting demands of the powerful Pratt & Whitney engines. Light weight and tremendous strength—the ability to stand high speeds and heavy loads, and yet assure long life, were essential. Despite extremely thin sections, "aircraft quality" gears must carry tooth loads far in excess of values customarily considered safe design and must operate at pitch line velocities that can be measured in miles per minute.

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"Aircraft quality" gears may solve problems for your engineers—they will assure higher speed, longer life, lighter weight, more compact design—they may even make possible new developments that otherwise would be impractical.

To aid your engineers in determining the advantages which "aircraft quality" gears will bring to your product, our engineering department is now developing an engineering manual which should be in the hands of every designing engineer—every production man—facing problems of power transmission. A copy will be sent on request as soon as it is ready.

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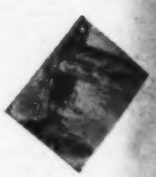

This informative product engineering manual on "aircraft quality" gears contains data on a new and revolutionary type of precision gear. A copy will be sent to you on request as soon as it is ready.

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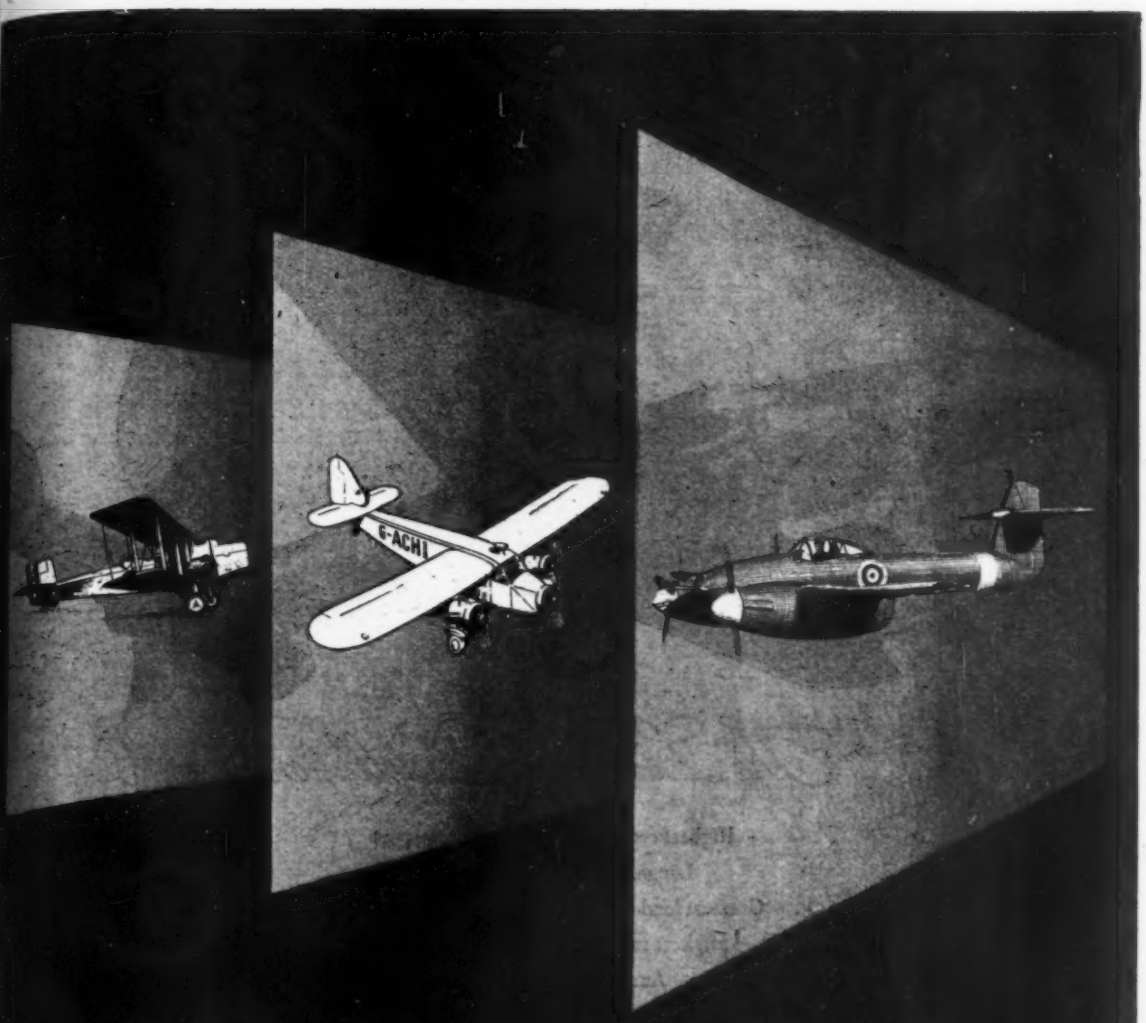

Experience extending from the twin engine Westbury fighter of 1926 to the Wessex Air Liner of 1930 and so to the Whirlwind fighter of to-day, gives assurance that Westland will be in the forefront of development to-morrow.

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And these performances
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Lockheed Aircraft Corporation, Burbank, California

SPITFIRES MAKE LONGEST TRIP

Melbourne, Friday.—R.A.F. Spitfires based on Northern Australia made the longest flight by Spitfires in any theatre of war when they attacked Timor, in the Portuguese East Indies.

The planes—of the long range, high-altitude type—made a round trip nearly 800 miles. They left many Japanese installations in ruins.

Daily Mail, 9-12-44.

VICKERS-ARMSTRONGS
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All that remains of the big 4-motored Jap flying boat after direct hits by U. S. Navy Liberator gunners is this wing tip with its Rising Sun insignia . . . No question about it, this Rising Sun is setting fast. Official U. S. Navy Photograph.

ONCE THERE WAS A JAP FLYING BOAT • •

It is merely small pieces now — thanks to the deadly aim of an American gunner aboard one of our huge Consolidated Liberators. These men on the firing lines of the air are doing a magnificent job . . . and American industry is backing them up with the finest aircraft in the world.

Everyone at CECO is proud that CECO carburetors and fuel pumps on the newest great Liberators and other warplanes play a direct part, however small, in helping bring Victory closer.

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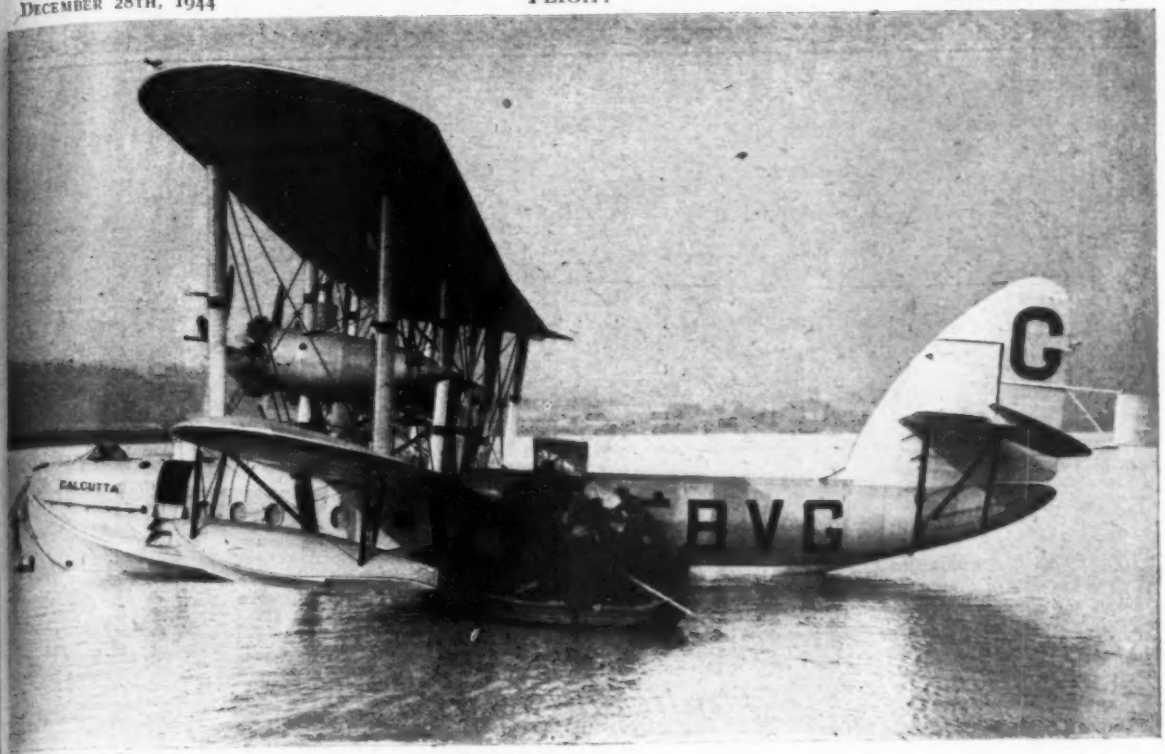

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Still flying—

after sixteen years....

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Flying Boat
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THE OLDEST ESTABLISHED AIRCRAFT COMPANY IN THE WORLD

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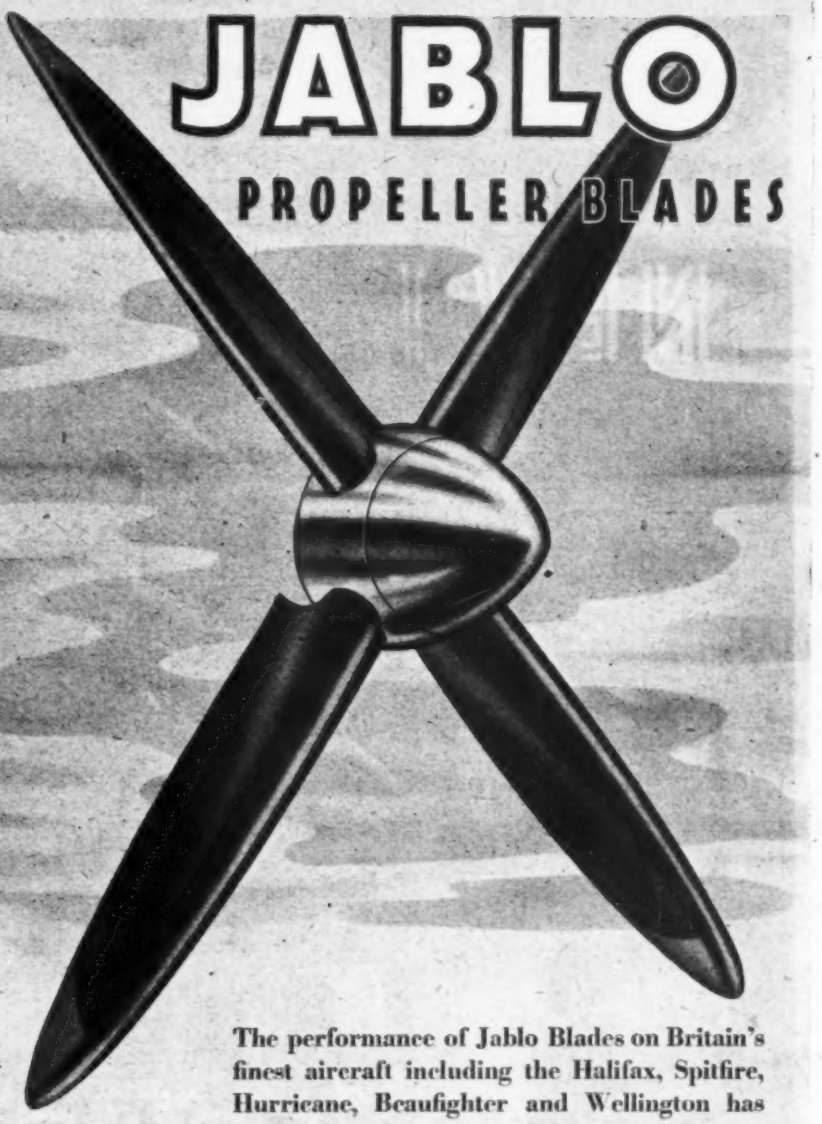

The performance of Jablo Blades on Britain's finest aircraft including the Halifax, Spitfire, Hurricane, Beaufighter and Wellington has earned them their reputation as "The best in the world".

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FLIGHT
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First Aeronautical Weekly in the World : Founded 1909

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The Outlook

"Tails Well Up"

FOLLOWING our usual custom, we publish in this, the last issue of the year, reviews of events and the "high spots" that have marked the past twelve months. Upon both aspects the nation may well look back with pride and satisfaction. Operationally as well as technically the year has been remarkably fruitful. The Allies have established in the air a superiority which almost amounts to supremacy. Nowhere was that fact more clearly demonstrated than in the invasion of France, during which the Allied air arms secured for the invading forces that freedom from interference without which the truly amazing speed of our advance through France into Belgium and Holland would have been impossible.

Recent events have, however, demonstrated once more that, although air superiority is the first prerequisite, it is not, by itself, sufficient to achieve victory. In conjunction with the other arms air power can do and has done wonders, but it cannot occupy a country and hold it, even with the vast numerical superiority enjoyed by the Allies. After a long lull during which little was seen of the *Luftwaffe*, German aircraft are now appearing in considerable numbers, a fact which indicates that the enemy had been conserving his aircrews, aircraft and fuel for the counter attacks launched recently by von Rundstedt. The fate of that attempt may well have been settled by the time this issue appears. It is obviously a desperate effort by Germany to reach something approaching a stalemate on the Western Front. But whatever the outcome on the ground, Allied air power will continue to strike at Germany in every spot which contributes to her war effort, and nothing that Germany can do will deter the Allies nor diminish the weight of their air attacks. Britain and the United States have not reached their maximum output, whereas Germany's is being reduced and hampered in every way. That process will continue and, if necessary, increase. Allied air losses are on a decreasing percentage scale, a fact which, coupled with their productive capacity, spells ultimate defeat for the enemy. That day may be postponed, but it is assured.

All Good Wishes for the New Year to Our Readers from the Editor and Staff, and may 1945 bring Peace in Europe.

Steady Progress

IN reviewing the year from a technical aspect, one is handicapped by the fact that no mention may be made of the latest types of aircraft, engines or equipment, the authorities insisting, quite rightly, on silence until such time as it must be assumed that the enemy has found out for himself. Consequently there is a time lag of some six months or more, and the review therefore virtually covers a period from something like June, 1943, to June, 1944.

Most outstanding of new aircraft types of the year because of its novelty was the Gloster jet-propelled monoplane with Whittle power unit. That machine was an experimental prototype, but during the flying-bomb attacks on London British jet-propelled aircraft were officially reported in operation. The lead established does not appear to have been maintained, since Germany has launched jet-propelled types on the Western Front, where no British or Allied machines of the class have yet been mentioned.

The White Paper published some weeks ago showed fighter production to be at approximately the same rate as in 1943. This in spite of the fact that a new fighter went into operation, so that production does not appear to have suffered by the change-over. The new fighter, the Hawker Tempest, gained laurels in the destruction of the flying bomb, its great speed enabling it to choose

its position for the most effective attack. The Fleet Air Arm was greatly strengthened by a new addition, the Fairey Firefly two-seater fighter, a machine which has already done excellent work although little has been allowed to be published. It will be produced in large numbers during next year.

Probably the most amazing aircraft of the war is the De Havilland Mosquito. Since its original conception it has appeared in almost every imaginable guise. As a bomber it can carry a 4,000-lb. bomb, and two new versions were announced during the year, one of them this week. The first was the XVIII, which fires a 57-mm. six-pounder with devastating effect on its targets. The latest is the Mosquito XVI, with pressure cabin for high-altitude work.

In the heavy bomber class the year has seen development of existing types rather than new models. The bomb loads have increased, the "bigger and better" Beaverbrook bombs having culminated in the "tallboy" 12,000-pounders.

Engine development is, by its very nature, a slow business, but it is satisfactory to record one new type for the year, the Rolls-Royce Griffon, an engine of more than 37 litres capacity. If one remembers the way in which the power output of the 27-litre Merlin has grown, there is justification for expecting a comparable increase from the 2,000 h.p. or so with which the Griffon started.

On the whole it may be said that although the year 1944 has not seen many startling innovations, it has been one of steady development and progress.

March in December

NOT since the time when airfields were flooded in North Africa have the armies had such an unfortunate denial of air support in battle as has now occurred on the Continent. Three weeks of really bad weather now might mean a tragedy. Three days of really clear weather might mean a wonderful victory.

How has it all come about? It is safe to say that what the enemy can do in December could not be achieved in March. The Germans have selected both time and place very cunningly. There are now 16 hours of darkness in each 24. If the barometer goes up at this time of the year fog usually supervenes; if it goes down, then rain, gales and low clouds put in an appearance. The area covered by the push is in well-wooded country, and cover from air attack is there in plenty.

It may be, as so many reports suggest, that this is one last desperate fling comparable with the one made by the Germans in 1918, when they broke right through our lines. It may also be that the Germans are very short of oil and petrol and have had to save up sufficient for this great attack. Further, it may be that the unsuitable time of the year for attack has been thrust on Rundstedt by our Supreme Command. To us, however, it appears as if the Germans have said to themselves: "We have no air support of our own. In what circumstances can we best nullify that of the enemy?"

Ever since El Alamein our air chiefs have been telling the Army generals that they must learn to fight without air support in case circumstances are ever such that it has to be withheld. The German Army, through much tribulation, has already learnt this most important lesson. It has been quick to take advantage of an unfounded complacency in the Allied ranks, and decided to march in December. This is the first time since air supremacy was gained over the Germans that a concentration of troops and supplies has been allowed to build up. The resulting battle must be very largely a ground affair only.

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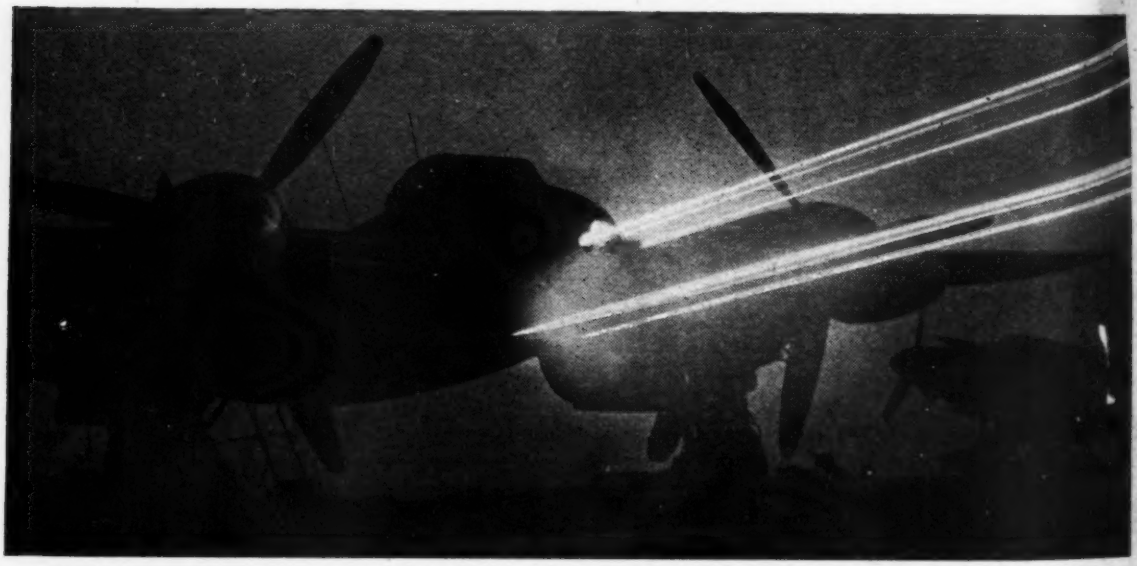


MUZZLE HORSE-POWER: A De Havilland Mosquito VI fighter-bomber demonstrates its fire power at night. The latest Mosquito to be released from the censor's ban—the Mosquito XVI with pressurized cabin—is described on page 685.

WAR in the AIR

Will History Repeat Itself? : News Black-out on the Western Front : Luftwaffe Up Again

MIXED GRILL : Albemarles, Halifaxes, Lysanders, Lightnings, Thunderbolts, Mustangs, Hurricanes, Spitfires and an Oxford at a maintenance depot in Italy.

GENERAL EISENHOWER, for security reasons, has forbidden all reports from the front other than official communiqués. This would have been a useless order if he had not felt convinced that the *Luftwaffe* would be unable to get much information about Allied measures to resist the great German counter-attack. No such step was taken during the great German advance against the British 5th Army in March, 1918. Certainly, at that time there was no Supreme Commander who could give such an order, for it was only at a later date that Marshal Foch was appointed Generalissimo on the Western Front. In many ways the present German effort by Marshal Rundstedt resembles the last great effort by Ludendorff in 1918. In that year the Allies, and particularly the British, held a superiority in the air, but not a supremacy resembling that now held. Baron von Richthoven was still alive when Ludendorff's offensive started, and his "Circus" of fighters was energetically contesting the superiority of the British. Both sides relied on their aircraft to give them information of the dispositions and movements of the other side, and it does not seem to have occurred to Haig that the enemy would be blinded if he put a ban on the reports of war correspondents.

Things are different now, and the air counts for far more than it did in 1918. Bad weather, of course, reduces the value of air reconnaissance, and a German attack in December is a different thing from one in March. The enemy gains more than the Allies do from the wintry nature of the weather, but that weather seems to have been very variable last week. On Tuesday, 19th, for example, the Straits of Dover experienced a fine springlike day, though it became misty at night. Such reports as have come through say that some of the enemy's initial attacks were badly upset by the way in which the Allied Tactical Air Forces diverted their attentions to onslaughts on the advancing German columns. On the other hand, thick fog over Field Marshal Montgomery's 21st Army Group reduced the number of tactical sorties there to under 100. On the same day the 9th Air Force only managed to send out one small formation of Thunderbolts, which attacked tanks and transport in the Monschau area. On the day before Typhoons were able to attack armoured vehicles near Stavelot, which is five miles to the west of Malmedy. In that sector the Germans had evidently made an advance of some 20 miles. Elsewhere there have been reports by American pilots of having created the greatest destruction of enemy transport since the Battle of Falaise. Obviously no clear picture is possible, but it is certain that the *Luftwaffe* has been thrown into the battle in greater strength than for a long time past, and that, on the whole, the weather has favoured the enemy more than the Allies.

It is definitely reported from all Allied headquarters that everywhere the feeling is one of confidence. The German attack had not been unexpected, for our aircraft had observed the massing of troops behind the

ONE FOR DAVY JONES : A Kumano-class Japanese cruiser hit by a Curtiss Helldiver (seen in right top corner) during the recent Philippine air/sea battle.

WAR IN THE AIR

German lines, and our leaders feel confident that they can hold it. A determined attack in force like this almost invariably makes some ground at first; but it requires a great superiority in numbers as well as in arms to be able to push it through to decisive victory. The Germans have not got those resources. They were better off in 1918; but when their first impetus was stopped, the recoil by the Allies (then united under Foch) swept back the Hunnish hordes to final defeat and surrender. If this German effort fails, the result may well be the shortening of the war.

Silesia

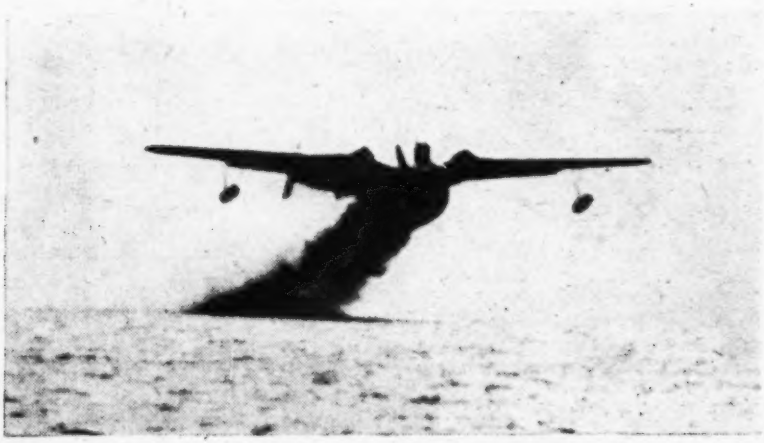
IN German territory the Ruhr is easily the most important coalfield, and therefore the greatest manufacturing centre. But there is another field of the same sort in Silesia (the territory which Frederick the Great once took from Austria after a long war), and once the Ruhr had begun to suffer seriously from the attacks of Bomber Command, the Germans began to develop the resources of Silesia. In the early days it was out of the reach of British bombers, and it appeared that comparatively little was known in this country about what was going on in Silesia. There is oil there, as well as coal, and the refineries grew busier as those in more accessible parts of Germany had been so battered that they were unable to keep pace with demands. The capture of Ploesti by the Russians still further augmented the importance of Silesia.

It is, therefore, very satisfactory to note that of late the U.S. 15th Air Force in the Mediterranean has been paying frequent visits to Silesia, and bombing the oil refineries. That force has also made a number of raids on targets in the area round Vienna. The "under-belly of the Axis" has made many things possible which the enemy once thought were out of the question.

BLITZ HOTEL: A modicum of comfort at a Typhoon dispersal point. The dug-out is not only weatherproof but it even boasts a fireplace.

In the Burma war the hill tribes of northern Burma and of Assam have made a very good name for themselves. They make excellent jungle irregulars, and can easily beat the Japanese at a form of warfare in which the latter were once thought to excel. The Americans have raised corps of Rangers (what we call Commandos) from the Kachin (pronounced Kucheen) tribes, and lately these Kachins have rescued more than 200 Allied airmen who have crashed or baled out behind the Japanese lines.

The raids by Superfortresses on Nagoya have been mentioned in previous articles. Since they were made photographic reconnaissance has shown that the Mitsubishi works were heavily damaged. More recently the same large bombers have raided Omura in Japan and targets in Shanghai and Nanking.



OUT OF THE DEPTHS: A Martin Mariner patrol flying boat being assisted off the surface by jet propulsion units. It appears to have been shot out from under the sea.

The R.A.F. in Athens

THE leaders of the E.L.A.S. rebels in Athens did not like the R.A.F. Its aircraft proved themselves able to spot and disperse strong points which the rebels had thought were quite out of reach of the British. They therefore planned a raid on the R.A.F. station, which was situated at the hill-side resort of Kephissa, some ten miles outside Athens. In the buildings there some 600 (one report says less) officers and airmen were living. The place had been chosen because the situation was pleasant and there was easy access from there to one of the airfields.

The A.O.C., however, Air Comdre. G. W. Tuttle, had moved his advanced quarters into Athens recently, using Kephissa as only a rear H.Q. It became known that the E.L.A.S. intended to attack Kephissa, and an armoured column was got ready to relieve the place. But the E.L.A.S. moved first. On the night of December 19th they attacked the place, and the fight went on all night. The R.A.F. men fought until their last cartridge had been fired. It was quite a gallant stand

The armoured column arrived about dawn next morning, but too late to save the position. It rescued some prisoners from the rebels, and brought back some wounded. Some staff officers are missing. Our casualties, however, are not believed to have been heavy.

It is stated that air operations in the area will not be stopped by this event. Nevertheless, it was a nasty set-back, and it ought not to have been allowed to happen.

WINGS ARE THE WHEELS OF TO-MORROW

The HAMILCAR

THE ONLY AIRCRAFT
CARRYING A TANK

A Product of

GENERAL AIRCRAFT LIMITED

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Light Night Striking Force

New Mosquito With Pressure Cabin Used for Bombing and Photographic Reconnaissance

THE Mosquito squadrons of Bomber Command which have inflicted such great damage upon the enemy are known as the Light Night Striking Force, which has nothing to do with the quality of the night conditions, but is based upon the lightness of the Mosquito as a bomber.

L.N.S.F. is run by the Pathfinder Force, and all aircrew are required to go through the Pathfinder specialised training course in addition to their normal aircrew training. This special training is the root of the wonderful accuracy obtained by L.N.S.F. crews in their bombing attacks on the enemy; but apart from the academic qualities of the training, the physical standard is particularly high, as only those in tip-top condition are capable of withstanding protracted periods of time at great heights.

To help in this matter, a pressurised cabin version of the Mosquito was evolved especially for the L.N.S.F., and was designated the Mark XVI. It was realised that the puncturing of the pressure cabin by flak or bullets would cause grave physical damage to the crew if the normal inside pressure was much above the atmospheric pressure obtaining, and thus it was decided to pressurise the cabin only to 2 lb./sq. in. over the external atmospheric pressure. In effect this gives interior cabin pressure equivalent to that of a height about five thousand feet below that at which the aircraft is flying. At extreme altitudes, this is a very valuable asset in combating fatigue and discomfort, and maintaining a reasonable reaction period.

The Mosquito XVI is fitted with Rolls-Royce Merlin 70-series engines, the starboard being a 72 and the port a 73 (carrying the cabin blower), each developing over 1,650 b.h.p. Ceiling is over 36,000 feet and maximum speed over 400 m.p.h., whilst range is in excess of 1,500 miles for the bomber version, and over 2,000 miles for the P.R. type. Bomb load is one 4,000 pounder or six 500 pounders—one under each wing and four in the bomb bay.

Air for the cabin pressurising is drawn in by the blower from the underside of the port-wing leading edge, outboard of the airscrew disc, and passes through a filter in the suction duct. From the blower it is fed through the cabin heater where it is warmed, and thence via a felt-lined duct and a non-return valve to the cabin. The non-return valve prevents the cabin being pressurised below 15,000 feet and is actuated by an aneroid capsule.

Cabin pressure is governed by a blow-off valve which relieves at 2½ lb./sq. in. above exterior pressure and normal leakage of approximately 30 cu. ft./min. prevents the air becoming vitiated. Should, however, the cabin pressure drop more than 0.5 lb./sq. in. at any altitude (above 15,000ft.) a red warning light shows and the crew then have to don their oxygen masks.

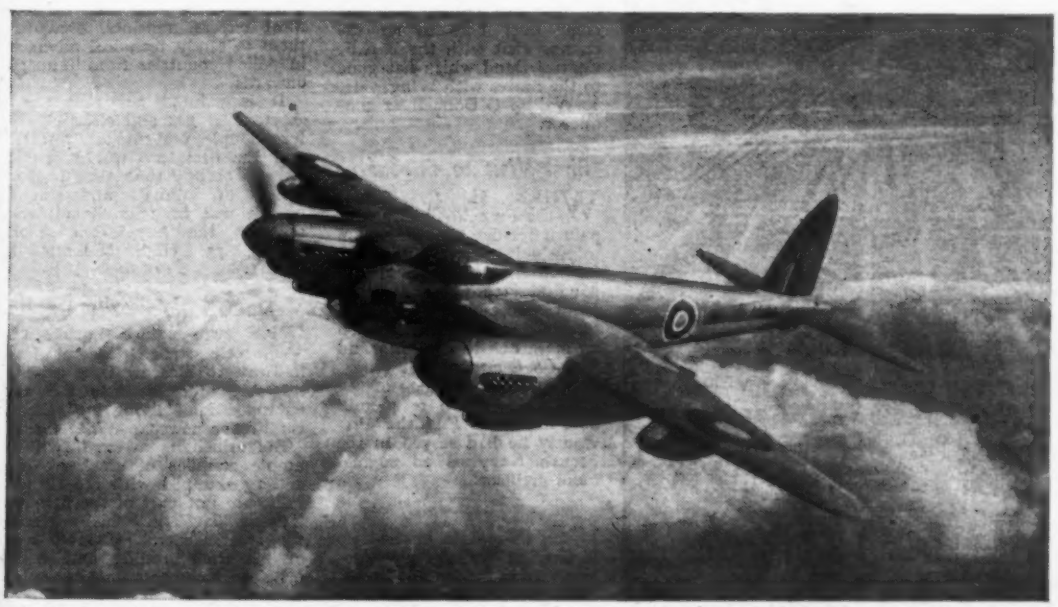
Sealing Difficulties

In all there are no fewer than 36 apertures in the cabin to be sealed—doors, hatches, windows, joints, cables, and control tubes—and these are glanded with rubber washers, plastic material and sundry other means. The wing to fuselage joint is sealed with felt strips soaked in a sealing compound, and the main cabin door is, by virtue of the differential pressure, self-sealing; but although virtually impossible to open at height, an emergency release valve is fitted to allow equalisation of pressure so that the aircraft can be abandoned if necessary.

The Light Night Striking Force are so serious a menace that some of their regular targets, particularly Berlin, are now defended by special anti-Mosquito guns which fire predicted flak to twice the height at which the heavy bombers normally fly. Jet-propelled aircraft have also been used but with indifferent success.

Maintaining the offensive against Berlin has been one of the L.N.S.F.'s most important tasks and it is now common for 50 or 60 Mosquitoes to attack Berlin by night. Since Bomber Command first operated these aircraft they have delivered well over 12,000 tons of bombs on Germany, over 2,200 of which have been received by Berlin.

A recent development is for this force to operate by day, reverting to the attacks which were discontinued when it was decided that all day attacks on Germany should be done by the U.S.A.A.F.



The fact of having a pressurised cabin in no way affects the smooth contours of the Mosquito—in fact there is, externally, nothing to indicate that a pressure cabin is actually employed.

HERE AND THERE

BASIC RATIONS! These hundreds of "jerry-cans," for refuelling aircraft at an advanced base, are not, as you might suppose, in the wilds of Burma but in France, whereas—

Lord Swinton Flies Home

LORD SWINTON, Minister of Civil Aviation, returned to England recently in an aircraft of R.A.F. Transport Command. He had been attending the International Civil Aviation Conference in Chicago and the Commonwealth Civil Aviation Conversations in Montreal, and flew back by way of Bermuda.

R.A.F. Man's Bravery

THE Royal Humane Society's testimonial on parchment has been awarded to Cpl. D. H. Herbert, a R.A.F. physical training instructor, of Knighton, Leicester.

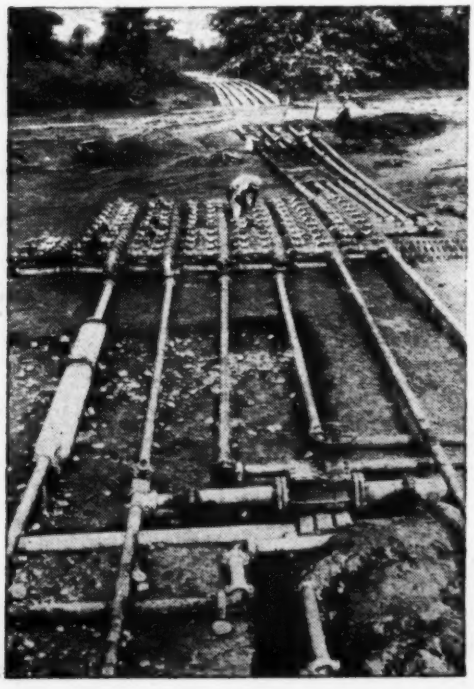
Cpl. Herbert, although not a strong swimmer, dived in fully clothed to rescue a three-year-old child who had fallen off a jetty at Grange-over-Sands.

A.V-M. Bennett to Stay

A.V-M. D. C. T. BENNETT, A.O.C. Pathfinder Force, told a Press Association reporter the other day that there is no truth in the report that he is leaving the R.A.F. to resume a position in civil life.

"I am not getting out," he said, "and my plans for the future are quite unknown to me."

As recorded in *Flight*, December 14th, A.V-M. Bennett was reported (by semi-official sources) to be leaving the R.A.F. to join British Latin-American Airlines.



—this up-to-date method of delivering fuel by pipe-line runs from India to North Burma and supplies thousands of tons of oil monthly into that uncivilised area.

"There's Nothing Like Music —"

THE concert given by the U.S. Army Air Force Band at the Albert Hall last Saturday was the first of a series to be given in about 20 British towns from Southampton to Dundee, and at R.A.F. stations. Its conductor is Capt. George S. Howard, and profits go to the R.A.F. Benevolent Fund.

The band is the leading one of the U.S.A.A.F. and has come over here in an exchange visit with the R.A.F. Central Band which has gone to the States with Wing. Cdr. J. Walton O'Donnell as conductor.

First Visit to England

WHEN M. C. Tillon, the French Air Minister, paid a five-day visit to London recently it was the first time he had been in England and his first cross-Channel flight. He was accompanied by Gen. M. Valin, chief of the French air staff, and the military and civil *Chefs de Cabinet*.

One of the founders of the F.F.I., M. Tillon is 46 and does not speak English. Previously he had served in the French Navy as an engine-room artificer.

The party was met at the airport by the British Air Minister and senior R.A.F. officers.

Scientific Journals for Europe

AN appeal for copies of scientific journals published during the war is being made by the Association of Scientific Workers on behalf of scientists in liberated Europe, particularly France.

It is pointed out that whereas in Britain there are well-stocked libraries which can be consulted, this is not the case on the Continent, and scientists there urgently need such journals, technical papers, reprints, etc., to enable them to study technical advances made in Allied countries from January, 1940, onwards.

It is pointed out that the present shortage of gas and electricity in Paris for example, prevents any research work, and the literature would enable scientists to occupy their time profitably.

Sets of journals and single copies (which will be microfilmed) should be sent to the Association at Hanover House, 73, High Holborn, London, W.C.1.

De Gaulle's "Flying Flat"

THE twin-engined Lockheed aircraft which carried General De Gaulle halfway to Moscow is a private plane set aside for his sole use and fully equipped for "living in," according to the French newspaper *Resistance*.

Six armchairs, a small writing desk, ample supplies of crockery and silver cutlery stamped with the Cross of Lorraine are but part of the fittings of this "flying flat" in which, according to the paper, General De Gaulle spent most of his time reading and working on private documents, while only rarely taking time off for a simple meal.

The plane's markings include the Lorraine Cross and the simple inscription

Mosquito—the little heavy bomber.
4,000 lb. to Berlin.
There and back in 4 hours.

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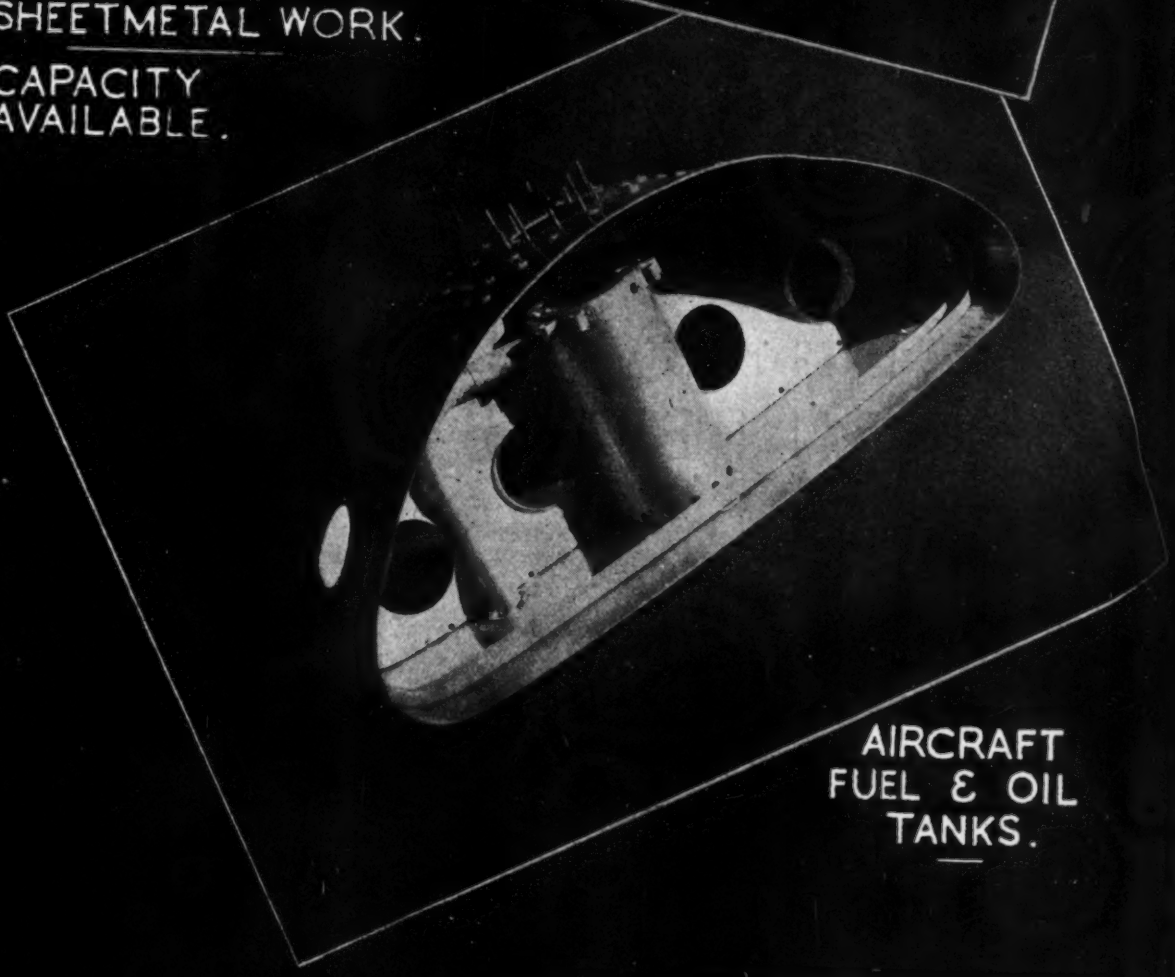

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HERE AND THERE

"France." It is flown by a specially selected crew of three who are always ready to take off at a moment's notice.

"Bombs of Truth"

ALLIED fighter-bombers are now using what Col. Philip Schwartz, armament chief of the U.S. Air Service Command in Europe, calls "bombs of truth."

These are made from the metal cases of parachute flares and each holds 12,600 tightly packed propaganda leaflets which are blown out and scattered by a small powder charge after being released.

The idea is to supplement the large type dropped by the heavy bombers.

Business as Usual

DESPITE the fact that the Hun has wrecked so many British chimney-pots, Santa Claus, it seems, is still in business, and it was arranged for him to pay a flying visit (literally) to an R.A.F. Fighter Command station this Christmas week at a party for the children of officers and other ranks.

For the benefit of the little guests, the programme included the signalling in of Santa's aircraft by the flying control officer (loudspeakers being rigged up so that they could all hear), the provision of a decorated car to taxi the familiar red-robed figure from the aircraft to the mess with his bag of toys (made by the W.A.A.F. and airmen), and a Mickey Mouse film show after tea.

R.A.F. Exhibition in Brussels

GENERAL PIERRE KOENIG, military governor of Paris, who recently visited the R.A.F. exhibition in Brussels, described it as "the finest he had ever seen."

He showed particular interest in the R.A.F.'s 4,000 lb. "factory busters" which dominate the exhibition, and in a demonstration of a Link trainer.

General Koenig was received by Air Vice-Marshal Elmhirst on behalf of Air Marshal Coningham, A.O.C.-in-C., 2nd T.A.F.

Nearly half a million Belgians have visited the R.A.F. exhibition since it opened last month.

"And, pray, what might 'Nil excretum Taurus' mean."

(Above) The 500 lb. bombs going down on Formosa look small under a B-29—until you get a close-up view of them (below) during bombing-up operations.

First Canadian "York"

VICTORY AIRCRAFT, LTD., Toronto, Government-owned plant making Lancaster bombers, recently turned out their first York. The aircraft was completed after Canada decided to build Douglas DC-4 transports at Canadian Vickers, Ltd., Montreal. The Canadian-built York is equipped to carry 40 passengers, has a range of 3,000 miles, and is powered with four Rolls-Royce 1,250 h.p. Merlins.

Fast Flights

A CANADIAN - BUILT Mosquito, piloted by Jimmy Follett, chief test pilot of de Havilland Aircraft of Canada, recently flew the 570 miles from Fort William, Ont., to the de Havilland airport, Toronto, in 83 min.—slightly more than 412 m.p.h. He flew practically all the way at 20,000 feet.

Follett had previously made a 55 min. flight from Toronto to La Guardia airfield, New York.

U.S. Surplus Aircraft

OF the total of 23,391 aircraft declared surplus by the U.S. Army, Navy and other government agencies, 6,239 had been sold and paid for by December 1st.

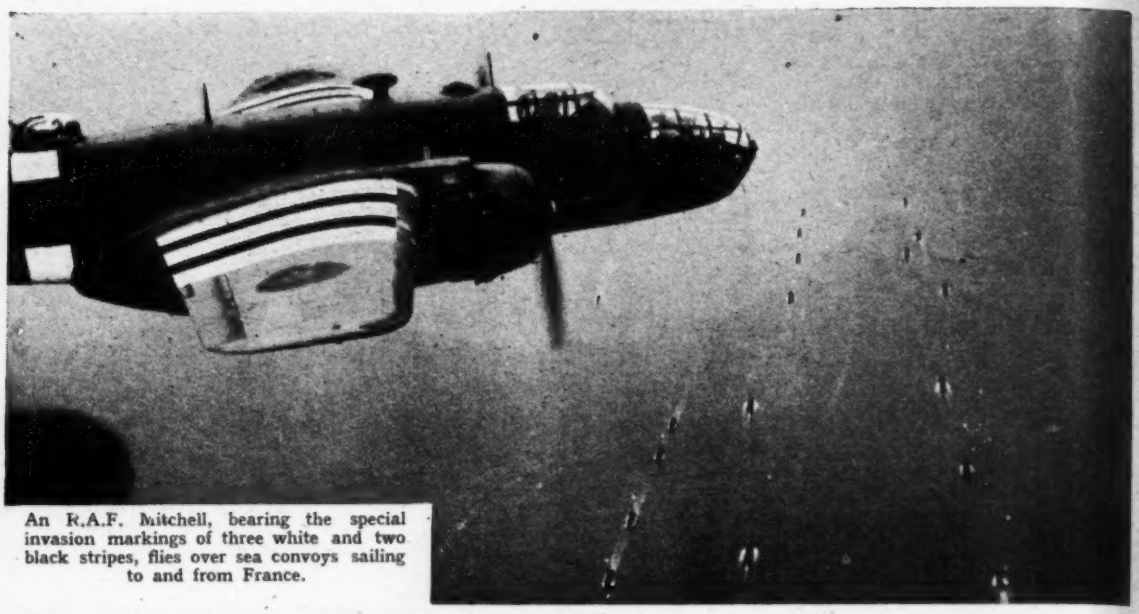
The majority of these aircraft are light civilian types requisitioned from their owners after Pearl Harbour for use in preliminary Service training, and also trainers formerly belonging to the Army and Navy, liaison and artillery spotting types, and short-range communication aircraft.

Not included in this total are the twin-engined transport aircraft which have been allocated to domestic airlines.

Burton-on-Trent Explosion

THE Meteorological Research Committee of the Air Ministry wishes to know at what places in the British Isles the recent explosion at Burton-on-Trent was heard. Reliable information upon the point would be of considerable scientific interest. The explosion occurred at about 11.10 a.m. clock time on Monday, November 27th, 1944.

Members of the public who heard the explosion are invited to assist in this investigation by sending a postcard stating where they were at the time. Postcards should be addressed to the Secretary, Meteorological Research Committee, Meteorological Office, Stonehouse, Gloucestershire.



An R.A.F. Mitchell, bearing the special invasion markings of three white and two black stripes, flies over sea convoys sailing to and from France.

Twelve Months of Air War

The Second Front : Rumania and Bulgaria Turn on Germany : Victory in Burma : Sea-Air Fighting in the Pacific

By MAJOR F. A. de V. ROBERTSON, V.D.

THE year which is now ending will go down to history as the year of the Second Front, of the liberation of France and Belgium. There have been many other successes and a few failures by the Allies. The successes, in the West and South, at least, have been mainly due to the acceptance as a principle of the words uttered by Sir Bernard Montgomery a year ago when commenting on his success in the campaign of Northern Africa. "We have never," he said, "fought a land battle until the air battle was won. That is the first great principle of war."

It was on that principle that General MacArthur acted as he pressed forward and northward in the Pacific until he was able to invade the Philippines. It was on that principle that General Eisenhower prepared for the liberation of France and the establishment of the Western Front. The matter was put even more strongly by the late Air Chief Marshal Sir Trafford Leigh-Mallory (whose presumed death was a great loss and a cause of great sorrow to all Britons and Americans) when he said that if there had been no Air Force on either side the landing in Normandy would not have been made, because the Germans, with the magnificent communications of northern Europe, would have been able to build up their forces at a speed which would have made it impossible for us to embark on the operation with any hope of success.

Heavies on Tactical Work

There have been other air developments during the year which deserve to be stressed. Among them may be mentioned that R.A.F. Bomber Command, previously a force which operated almost entirely by night and for preference in a strategic rôle, took to tactical bombing by daylight, and on several occasions made the first attack on a fortified position which was within range of the guns. The latter did not open up until the heavy bombers had done their share of the work. On the other hand, American heavies, which had previously always worked by day, sometimes undertook night operations. The fighting in Italy confirmed the principle that in mountainous country, and especially during bad weather, an Army which was markedly inferior in air power could still offer very effective opposition to the advance of its opponents. In the Pacific war the aircraft carrier increased its prestige; while in Burma air transport proved to be a tactical weapon of a most telling quality. The sinking of the battleship *Tirpitz* at her moorings by three 12,00-pounder bombs, two of which were direct hits while the third was a near miss, may perhaps teach lessons for the future; but as we are still uncertain of what actually happened it is as well to withhold judgment. Jet-propelled aircraft and rocket-propelled aircraft made their appearance in air operations during the year, without having any effect on the results of the operations; but they may prove more useful in the future. The German use of flying bombs (or air torpedoes) and rocket bombs had no effect on the course of the war.

Bomber Development

The art of heavy bombing made advances during the year, and bomb-aiming became much more accurate. Thick weather which grounded Tactical Air Forces did not prevent the heavies from attacking obscured targets with precision; and towards the end of the year we began to hear of "master bombers" taking charge of the operations. In land battles Typhoons equipped with rockets became potent allies of the infantry and the armour. The arrangements for supplying prompt air support for the ground troops were effectively developed during the year.

Thoughout the year the *Luftwaffe* had little, if any, effect on the course of the war. In February it indulged in a minor "blitz" against southern England, but very rarely did so many as 100 bombers cross the coast in any one night. Their tactics were to scatter widely as soon as they were over England, so as to disperse the defence. The gun barrage over London was deafening, and deprived many people of sleep who would have been little disturbed by the small number of bombs which fell. It was generally be-

lieved that the bombers responsible for this little "blitz" were a force held ready to strike at our invasion forces when the time came.

Step by Step

Our preparations went on, regardless of the activities of the German night bombers. The probability is that they learnt little from their night forays; while reconnaissance machines by day were very much in awe of our formidable array of Spitfires and other fighters.

Our policy was to put the invasion in the hands of those leaders who had proved their merit in the Mediterranean campaign. General Eisenhower was appointed Supreme Commander, with Air Chief Marshal Sir Arthur Tedder as his Deputy. This was the first occasion on which such a post had been entrusted to an Air Force officer. General Spaatz came back to England to take command of the U.S. Strategic Air Force, which included the 8th Air Force in the United Kingdom and the 15th Air Force in the Mediterranean. This was another novelty. General Eaker was transferred from England to the Mediterranean to take the place of Sir Arthur Tedder. General Alexander, whose victory in Tunisia had been the most complete of any in the war (and few other wars can show such a cataclysmic victory) was entrusted with the task of completing the liberation of Italy; while Sir Bernard Montgomery had to leave his beloved 8th Army there and come north to command the actual land fighting in the invasion. Soon after Air Marshal Sir Arthur Coningham was transferred from the 1st Tactical Air Force in the Mediterranean to command the 2nd T.A.F. in Great Britain. The American 9th Air Force was brought up also from the Mediterranean, and was joined with the 2nd Tactical Air Force of the R.A.F. to form the Allied Expeditionary Air Force under Air Chief Marshal Sir Trafford Leigh-Mallory. He also had under his command the body of fighters led by Sir Roderic Hill, and temporarily denominated Air Defence of Great Britain. Before the end of the year the title was changed again to Fighter Command.

During the early part of the year, the R.A.F. was largely

A salient feature of the year's air war was the sustained attack by the Americans on the German aircraft factories. Above is a raid by Fortresses on the Messerschmitt factory at Wiener Neustadt.

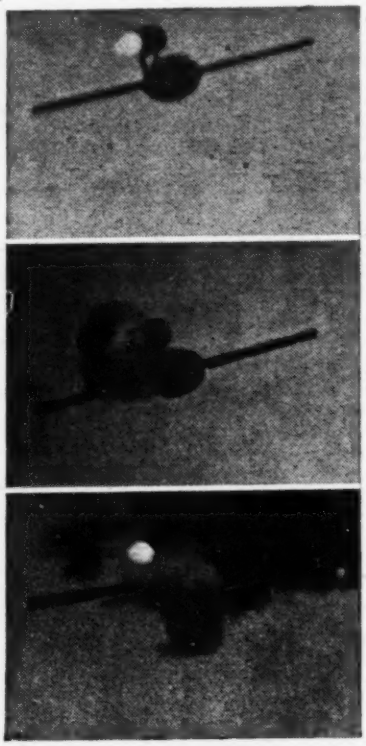
Within four days of the invasion of Normandy, airstrips were being used by Allied aircraft. After four years the R.A.F were back on the Continent.

TWELVE MONTHS OF AIR WAR

engaged in bombing to destruction 100 stations prepared for the discharge of flying bombs, which had been discovered by reconnaissance aircraft. Many of these were in the Pas de Calais. The work was very thoroughly accomplished; and though the persistent Germans promptly set about erecting new launching sites, these were not ready for use until the month of June.

At the same time, all through the early months of the year, the British and American Air Forces struck continually at factories where German fighters were made or assembled. Large numbers were also destroyed in raids on airfields. These activities practically drew the teeth of the *Luftwaffe*. Over a year before the Germans had slackened off the production of bombers in order to increase their strength in fighters. This was in itself a confession that Germany had been driven on to the defensive. They did, in fact, succeed in increasing their first-line strength in fighters by 1,000 machines, but this Allied assault on their fighters cancelled out their efforts. Moreover, it was stated by an authority in America that the Germans could not train enough crews to man all the fighters they possessed. That seems hard to believe. Anyway, a policy of conserving fighter strength, and accepting many blows without attempting to avert them, soon became apparent.

It followed, of course, that the bombers which they did possess were useless unless they could be given fighter cover. So the raiders of February faded away into obscurity. It should not be forgotten that the success of the Allied attacks on German fighter production was largely due to the ability to strike northwards from the Mediterranean against targets which the Germans had believed to be out of the range of the Allied air power. That was doubtless why President Roosevelt had acclaimed the capture of the Foggia airfields as of such strategic importance.



A flying bomb suffering at the hands of a Tempest pilot. Flying bombs started arriving about 10 days after D-day.

The Greatest Task of All

While many air activities were going on wherever the Axis Powers were in conflict with the Allies, the most important work in progress during the first part of 1944 was the air preparations to make possible the landing in Normandy. That meant a long and intensive attack on communications of all sorts, and particularly on the bridges over the Seine between Paris and Rouen. In good time all of them were destroyed. The railway system between western Germany and northern France is as good and as complex as anywhere in the world, and it was impossible to destroy every line. Moreover, lines can be quickly repaired, and it is more profitable to cut them after the battle has joined, when the forward troops are impatiently waiting for reinforcements and supplies, and when the delay of even a few hours may have far-reaching results.

The same applies to roads, and side by side with roads go petrol supplies. In the early part of the year Ploesti was being frequently bombed, sometimes by the Russians, and they captured the place about the beginning of September. But for invasion purposes it did not matter what supplies of oil the enemy might draw from south-east Europe. The important thing was to prevent his vehicles moving up to the front line. So oil refineries and synthetic oil plants in the Ruhr became targets of major importance. After the landing had been effected these targets remained important; but by then it was an even more urgent necessity to block the roads and destroy the vehicles moving on them. The comprehensive air supremacy held by the Allies enabled Leigh-Mallory to do all that was needful; and it certainly could not have been done better.

There was one more necessity. The Germans knew that an invasion was coming, and they hoped that the great congregation of shipping would provide an excellent chance for their U-boats. They recalled most of them from the Atlantic, and massed them round the approaches to the Channel. This had been foreseen, and the Navy and Coastal Command together had laid their plans. The approaches from both north and south of Ireland are narrow, and the watchfulness of the Navy and Coastal Command defeated the plans of the German U-boat commanders. The U-boats had not been very successful in 1943, and in the latter half of that year they had sunk less than one ship in every thousand which set out across the Atlantic. Of the invasion fleet only one merchant ship was sunk by underwater attack, and it is doubtful whether that was due to a torpedo from a U-boat or to a floating mine. Everyone will agree that this result was most remarkable, and reflects the greatest credit on the Royal Navy and Coastal Command.

The Invasions

June 6th proved to be the D-Day which had been expected so long. The heavy bombers knocked out many of the coast guns in advance, and airborne troops were landed to deal with the crews of others. All went well, and the breach in Hitler's European Fortress was made with really surprising ease.

About the middle of August the second landing was made in the Riviera by French and American troops. There, too, airborne troops were landed in advance to seize the coast guns, but the opposition was so slight that they were scarcely needed. The aircraft from a number of British and American carriers gave air cover and support up to the limit of their range.

The subsequent manœuvres in Normandy proved that the Germans could get no satisfying information from their reconnaissance aircraft, and so Gen. Montgomery was given practically a free hand to do what he liked. He massed the British 2nd Army and the Canadians opposite Caen, and by so doing drove Field Marshal Rommel to congregate the bulk of his armour and best troops opposite to this position. Gen. Bradley, with his American Army, was sent to clear the Cherbourg peninsula and capture the port of Cherbourg. He also invested the ports of Brest, Lorient, La Pallice, etc., on the Bay of Biscay, while the R.A.F. bombed them. This drove the U-boats away from this most favourable neighbourhood, and they ultimately chose as their chief base Bergen in Norway.

Then came a great surprise for Rommel. Bradley's armour, "dropping the lead out of its shoes," as the Americans say, made a speedy dash round the left flank of the Germans, and came up on the south side of the German 7th Army which was opposing the British and Canadians. Caen had to be heavily bombed, and was then captured. The German 7th Army was practically surrounded, and only small disorganised parties were able to get out of the death trap and make for the bridges at Rouen. They were

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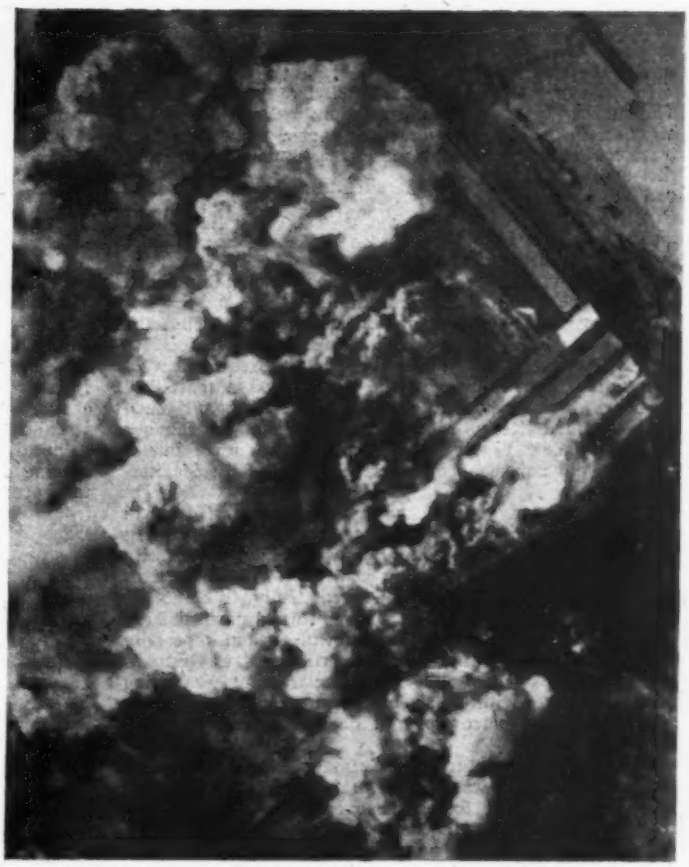
TWELVE MONTHS OF AIR · WAR

hammered by aircraft all the way, and many were slaughtered as their vehicles thronged the roads to Rouen itself.

Montgomery followed up with a lightning dash which liberated Belgium. Then, as the Channel ports had not been captured, and the water-way up the Scheldt to Antwerp was under fire, he had to pause and wait while he built up his strength for the next move.

The 1st Airborne Army, consisting of both British and Americans, was dropped ahead, and was able to secure the branch of the Rhine known as the Waal, but the division dropped at Arnhem was unable to secure the crossing of the branch called the Lek. The division fought with magnificent courage; but finally the survivors, 2,000 men out of 7,000, were ferried back across the river.

Almost simultaneously with the invasion of Normandy the Germans started an indiscriminate attack on southern England with flying bombs, or air torpedoes. Fortunately, by then the R.A.F. had acquired a number of Hawker Tempest fighters. Defence arrangements had to be made in a hurry. The A.A. guns were all moved out of London, and others brought south from other parts of the country. The fighters formed the first line of defence; behind them were the guns; and finally there was a barrage of 2,000 balloons. The fighters had to work out new tactics for dealing with the robots, and this was quickly done. It may be mentioned that the balloon cables alone brought down no fewer than 278 bombs. The infliction was unlike the previous bad times which London and southern England have had to endure during this war, because the bombs came over by day as well as by night. They did not, however, kill so many people as bombs dropped by real aircraft had done. Their chief effect was widespread blast, and the main danger was from splintered glass.



(Above) The steel works at Caen, a German stronghold, being punished by tactical bombing. (Left) A Horsa glider on tow by a Short Stirling during the fateful landing of the 1st Airborne Army at Arnhem.

The Allied advance in France overran most of the sites from which the bombs were launched, and so brought considerable relief to the people of southern England. Then the Germans tried mounting the robots on bombers, flying out over the North Sea and launching them from there. The aiming was very erratic, and the number which arrived in England was not great. The next weapon tried was the rocket shell, which had greater penetration but less blast effect. Germans prisoners of war often complained that their authorities were wasting effort on the V weapons, as they were called, when the production of more aircraft would have helped the German soldiers in their battles. That was a natural view for soldiers to take; but it is more than doubtful whether any effort the German factories might have made would have disturbed the air supremacy of the Allies, based as it was on an abundance of fighters flown by supremely skilled pilots.

As the fighting moved farther away from the shores of Britain, the rules for the black-out were partially relaxed. The greater ease with which a road could be crossed after dark was an outward and visible sign that the war was going well for the Allies.

The Air Side in Italy

The air side of the war in Italy does not make such an interesting story as that on the Western Front. Gen. Alexander was opposed by Kesselring, who was a *Luftwaffe*

TWELVE MONTHS OF AIR WAR

General, but who must have been told at the outset that he would have to manage with a very minimum of air support. This would matter less for him, as the fighting was in the mountains.

In January Gen. Alexander landed a force at Anzio. The landing was a combined operation, with carriers giving air cover in the initial stages. The spot was chosen for air reasons. The carriers could not safely remain for long off the shore, and air cover had to be provided by R.A.F. squadrons based in Sicily. Fighters from there could reach Anzio and spend some 20 minutes over it. It was the only suitable beach for a landing within air range from Sicily.

As there were plenty of fighter squadrons in Sicily, the A.O.C. was able, by skilful organisation of reliefs, to ensure that there were never less than the equivalent of four fighter squadrons over the beach. As a matter of fact, these fighters had little to do, as the *Luftwaffe* made no determined attempt to interfere with them. It thought it better policy to try to damage our warships, but it certainly did not shake our naval mastery of the Mediterranean.

The Allied advance through the Apennines in bad weather was a slow and grim affair, and at times it almost seemed that the German plan of disregarding air superiority in the mountains would prove justified. Cassino held us up for a long time. First we had, regretfully, to bomb the monastery; and then the R.A.F. was turned on to destroy the little town. It was an act of doubtful wisdom, especially as the place was within range of our artillery. The Germans hid in rock passages while the bombardment was going on, and emerged with their machine guns when our infantry advanced. The place was not finally stormed until the middle of May.

Soon after its capture the Germans evacuated Rome. General Alexander was highly praised for the adroitness of his tactics, which forced the enemy out of the Capital without any battle having been fought in Rome itself.

For most of the weary and bloodstained way up through Italy the 1st Tactical Air Force had to employ itself by hampering movements behind the German lines. On the other hand, the German weakness in the air allowed General Alexander to move his divisions about from east to west and back again without the enemy knowing anything about it until a surprise attack was launched. However, since the capture of Ravenna, we have heard of the Desert Air Force, as it still proudly calls itself, being able to intervene in a land battle, and put to flight a strong force of German Tiger tanks.

The 14th Army in Burma

Recently the 14th Army in Burma complained that it was "the forgotten Army." It certainly does not deserve to be forgotten. It is a very large Army, and it has been living hard and fighting hard. It has been said that nowhere is the collaboration between the ground troops and the air closer or more effective than in Burma.

The Eastern Air Command has obtained a superiority over the Japanese Air Force which has not been surpassed on any other front. The enemy fighters seem unwilling to interfere with our aircraft, and one rarely hears anything about effective work by Japanese bombers. The Japanese seem to have difficulty in obtaining bomber replacements; though the supply of fighters is ample.

This Allied air supremacy has allowed the Vengeance dive-bombers to take a very active part in the jungle fighting. Their attacks on enemy positions have been most effective. The poor quality of communications in Burma gives great scope for Allied bombing attacks on the comparatively few railways and roads, and also on the more important river communications. One constantly reads of supply *sampans* on the various rivers being attacked by Allied bombers.

Perhaps the most distinguishing feature of the air side of the war in Burma is the use which has been made of air transport and air supply. Everyone knows about Wingate's Chindits; but that is not the whole story. Whole divisions have been moved by air in a way which almost makes one gasp. Not less important is the manner in which isolated strong points have been supplied with food, ammunition, and most other necessaries by the transport Dakotas. On occasions when there was no possibility of making a landing ground near a force, flying boats have brought supplies and have alighted on a convenient lake.

There are now Superfortresses in India, and they have bombed the Japanese bases at Rangoon and Bangkok. There are carriers with the British Fleet in the Indian Ocean—presumably stationed at Trincomalee in Ceylon. Altogether, the air, combined with the hard fighting of the British and Indian troops, has made the life of the Japanese soldier in Burma far from a happy one, and his chances of ever seeing his home again seem pretty remote. It cannot be long now before it will be possible to send Admiral Mountbatten the landing craft which he needs for making an inroad in the south of the country. We need to capture the port of Rangoon.

The Eastern Front in Europe

During the year the Prime Minister told the country that Russian production of aircraft was roughly equal to ours. Soviet communiqués seldom have much to say about the air side of their operations; but correspondents every now and then mention the good work of the Stormovik support bombers. The aircraft of the Black Sea Fleet have made a name for themselves, and one sometimes hears of the aircraft of the Baltic Fleet.

Early in the year the Russians drove off the Germans who had been besieging Leningrad for so long. They cleared Estonia and most of Latvia, crossed the German border into East Prussia, and approached Warsaw. At these two places their impetus petered out before very strong German resistance, and this despite the fact that the *Luftwaffe* has less than half its bomber strength and only a small fraction of its fighters on the Eastern Front.

But far in the south great success has attended the Russian arms. During the year Rumania deserted her German ally and declared war on her. Bulgaria (which had never been at war with Russia) also declared war on Germany, and in consequence the Red armies swept through the northern Balkans, closing in upon Budapest, threatening Vienna, and breaking into Czechoslovakia.

At the other end of the long line, the Finns asked for peace and accepted the Russian terms. These included the expulsion or internment of the German forces in Finland, and Russian columns went to help the Finns in the task. Following up the retreating Germans, the Russians crossed into Norway and captured Kirkenes. Their approach drove the *Tirpitz* southward, and so contributed to her destruction by Bomber Command.

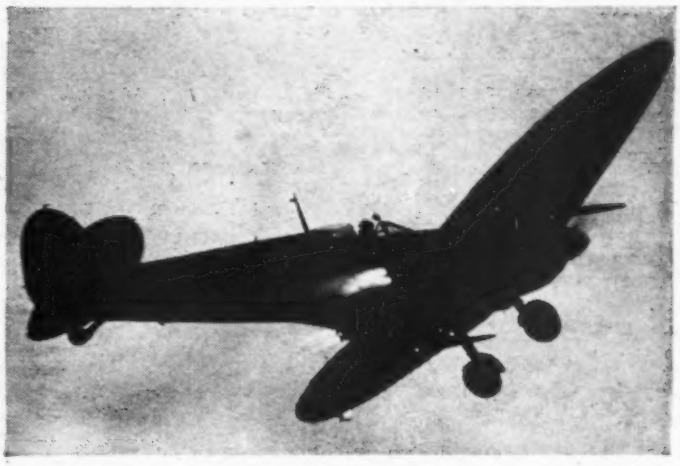
The Pacific War

It looks as if next year we shall be writing about the war in the Pacific and nothing else. Let us hope that it will be so. In February Gen. MacArthur said that the campaign in the Solomons was over. At the end of May he announced the conclusion of the New Guinea campaign. During the year Superfortresses have several times bombed Tokyo and other military targets in Japan, especially after the capture of the island of Saipan. In October the U.S. Pacific Fleet engaged the Japanese off the Philippines and won what Mr. Churchill called "a brilliant and massive victory." The Japanese had no fewer than eleven battleships in the battle. They lost at least two of them and four carriers.

Later in the year the Americans landed in force on the Philippine island of Leyte, and a while afterwards on Mindoro. The Japanese sent seven convoys to relieve Leyte, and all were defeated and practically annihilated by American aircraft.

RETROSPECT

High Lights of Technical Development in the Air-Year 1944



A Seafire taking off with rocket assistance. Two rocket tubes are fitted to each wing roof and contain cordite which burns for four seconds, by which time the machine is airborne.

DURING the past twelve months a great deal has been accomplished in providing new and improved equipment for the Allied air forces. In many instances there have been new models of existing aircraft types, or new models of well proven engines, whilst in other cases we have seen entirely new ground broken; but whatever the instance, one must remember that the 1944 birth has been preceded by months, sometimes years, of experiment and research.

This is well illustrated by the years of development which preceded the successful evolution of jet-propulsion; undoubtedly the greatest single technical advance which eventuated during the year. In this connection we must take this opportunity of dispelling the impression that this country is lagging behind America and Germany in the active use of jet-propulsion.

It is, of course, fairly well known that the Whittle power unit was sent to the States in conformity with the bi-lateral agreement of reciprocal aid, and that with typical drive the Americans produced a jet-propelled aircraft in a very short time. Photographs of this Bell twin-jet machine were published, and somewhat later came the news of the German Me 262 twin-jet and Me 163 rocket propelled aircraft. These revelations rather forced the British hand so that a photograph of a Whittle-powered Gloster aircraft was published, the implication being that the machine shown is the British contribution to the jet propulsion fashion. We should like it to be realised that the British "squirts" which were first reported to have been used operationally against the flying bomb are somewhat different from the aircraft shown in the released photograph. More than this cannot be said, but it should be appreciated that this country is still in the jet propelled lead and likely to remain so, despite the fact that we do not make a song and dance about what we have achieved.

In the field of aircraft alone, 1944 has seen the inception of no fewer than five entirely new British aircraft and eight new models of existing types. America has given seven new types; one of which (the Kingcobra) is really a development of an existing machine. These new aircraft are "active," that is, they do not include amongst their numbers the projected types such as the Miles M wooden single-seater fighter or the Bristol Freighter.

New Types

First to appear was the Albemarle twin-engined glider-tug and paratroop carrier, a machine chiefly remarkable for its composite wood and steel construction and in that it is the only operational British aircraft to employ a tricycle undercarriage. Next came the Fairey Barracuda bomber-torpedo-reconnaissance Fleet Air Arm aircraft, with its high-wing and curious looking but very effective Fairey-Youngman flaps.

It should be borne in mind that although many of the aircraft cited in this review are given as being introduced

The first British jet-propelled aircraft which flew initially on May 15th, 1941. This is the only photograph of our j.p. aircraft yet released, but the machines in operational use today differ considerably from that shown above.

RETROSPECT

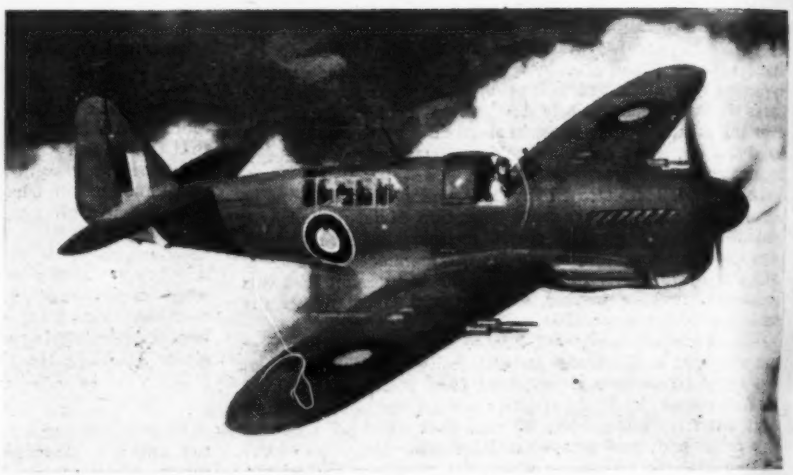
in 1944, in many instances they have been operational for a considerably longer period, but have only been released from the secret list during the last twelve months.

In the light plane class came the Auster IV, a development of the peacetime Taylorcraft and a little machine which has done really magnificent work for the Army. The Taylorcraft had an excellent reception as a club machine in 1938, and without doubt has a very large and full future awaiting it in the peaceful years to come.

In April, first mention was made of the Mk XII "clipped wing" Spitfire for low-altitude operation, this machine being the first to be powered with the latest Rolls-Royce engine, the Griffon. The Griffon is a V-twelve engine of 36.7 litres (as compared with the Merlin's 27 litres capacity) and is available with various supercharging arrangements to fit it for differing power/altitude requirements. A single-stage, two-speed blower is used for the Spitfire XII, and the power output is slightly over 2,000 b.h.p. Another unusual feature of the Griffon is the provision of a drive for the Rotol gear box on which are mounted the various auxiliaries such as generator, vacuum pump, hydraulic pump and compressor.

The next aircraft to appear was the Hamilcar tank-carrying glider, a wooden giant of 110ft. wing span which gave the Germans a great shock when it was first used on D-Day. A description of the Hamilcar appeared in *Flight*, December 14th issue.

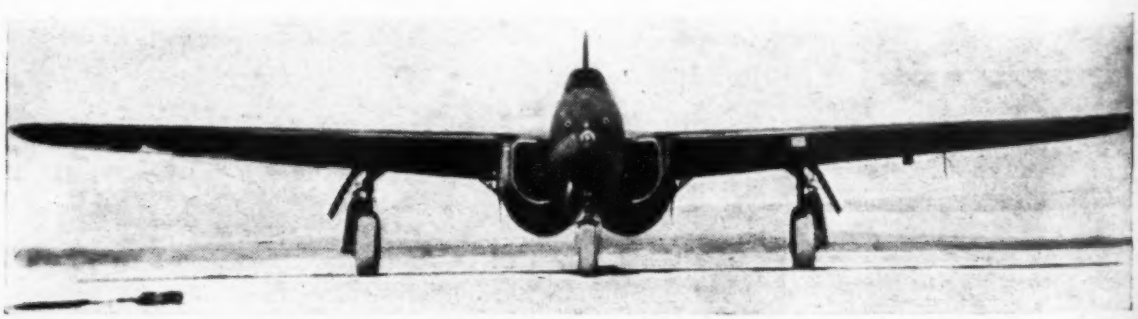
After the invasion of the Continent, the next two operational aircraft of which mention was made were American, (1) the Black Widow twin-engine, twin-boom, three-seater night fighter, which, although an ungainly and ugly machine, is credited with a good performance; and (2) the far-famed B-29 Superfortress of which we have recently been hearing a good deal concerning its very long-range bombing attacks of the Japanese homeland.



Fairey contribution. (Top) **The Barrucuda, which, despite the design specification, is a remarkably clean job, and (Bottom), the Firefly, latest and cleanest of F.A.A. aircraft. Between them, these machines cover the whole naval flying programme.**

Superfortresses bear but a superficial resemblance to the much smaller Flying Fortress as the wing is a Davis type of very high aspect ratio (as on the Liberator) and the nose is proportionally much longer. The cabin is pressurised and bombs are housed in two separate bomb bays.

Mention of the Liberator serves as an introduction to the Consolidated Company's design of their model "39," a civil version of the Liberator having, as with the York/Lancaster, a new fuselage with standard Liberator undercarriage, wings and power units, and the single fin and



The Bell Airacomet jet-propelled fighter, which is powered with two G.E.C. gas turbine units, developed from the Whittle design given to America under Lease-Lend. An interesting machine.

As designers and manufacturers of a British sparking plug used in American aircraft

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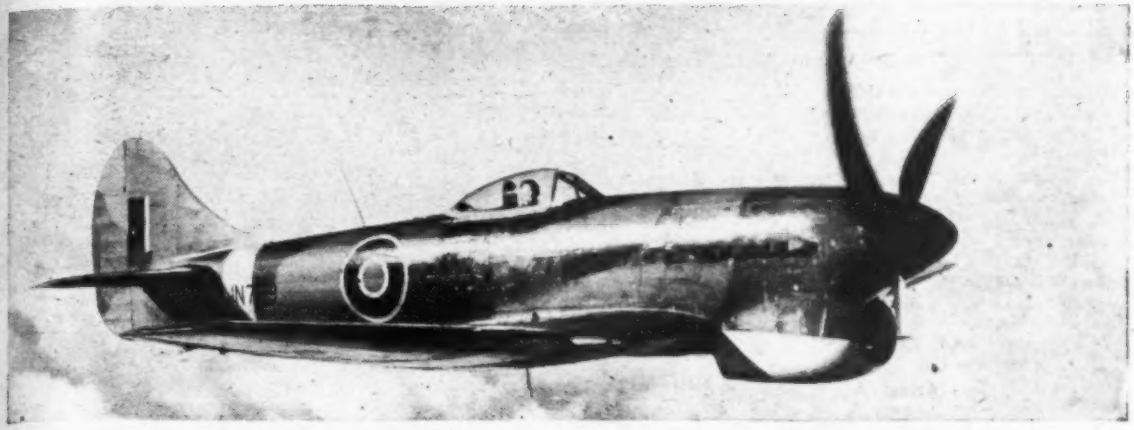


Hawker Tempest : Clean lines and very thin wings characterise the latest Hawker fighter. It is a good deal faster than the Typhoon, although using the same 2,200 h.p. Napier Sabre engine.

RETROSPECT

rudder as fitted to some of the later "Libs." All-up weight is given as 56,000 lb., and although one or more machines have already been built, production, it is said, will not begin until after the war.

July brought news of the Spitfire XI Photographic Reconnaissance machine which uses the 1,650 h.p. Merlin 60 series engine, some aircraft using the 61, and others the 63 or 63A, but all these engines are rated for extremely high altitude and make the Spit XI the fastest orthodox aircraft in the skies at its optimum height. This is facilitated by the fact that no armament is carried and every possible excrescence is eliminated, which, together with the polished skin surface, offers the least drag combination possible with the aircraft, very important points indeed when sheer speed is the only means of keeping unscathed.

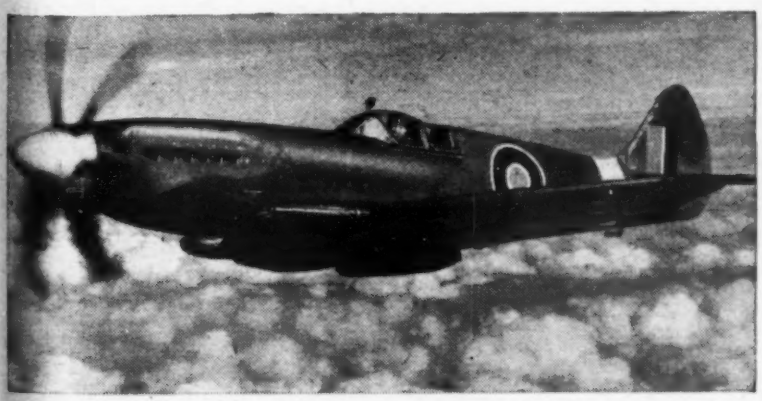
An interesting but apparently unsuccessful experiment was shown in the American Budd Conestoga cargo transport aircraft of welded stainless-steel construction. The Conestoga was a twin-engined high-wing machine of 100ft. span with a tricycle landing gear and boat-shaped body raked upwards at the rear to provide rear entry up a ramp to the middle fuselage compartment. Production was stopped a short while ago due, we believe, to production difficulties.

Spitfires again come into the picture with changes in the armament of the Mark IX, this model now qualifying almost for the title of Fighter/Bomber by carrying one 500 lb. and two 250 lb. bombs; in addition, the Mark IX is the first British aircraft to use 0.5in. calibre guns, two of which are mounted in addition to the two 20 mm. cannon. Altogether a very offensive little aircraft.

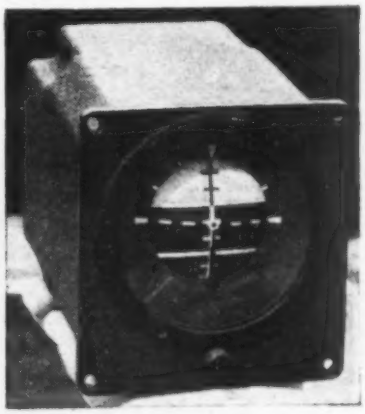
Further Spitfire development was still to come, however, and the latest model released this year was the Mark XIV. This machine was also the medium of introducing the Griffon XLV two-stage, two-speed supercharged engine of 2,200 b.h.p., and also the Rotal five-bladed airscrew, the combination of the two providing the Spit XIV with a terrific rate of climb and a performance at great height matched only by its junior brother, the P.R. Mk. XI. When speaking of the highest speeds of orthodox aircraft one must make a proviso of the speed of the "squirts," which, of course, are very quick indeed and get faster the higher they go. What the performance is of the German Me 262 has not been officially stated; nevertheless, we have not as yet heard of a Spitfire XI or XIV succumbing to an Me 262, although conversely, a number of 262s have been shot down by our orthodox machines.

Unorthodoxy Again

America again enters the lists with the P-36 Kingcobra, a development of the unusual, but not very successful Airacobra. The royal version is claimed to have improved speed, ceiling and range compared with the original, and additionally, armament comprises a 37 mm. cannon firing through the airscrew hub and four 0.5 in. machine guns. We cannot, however, foresee that the Kingcobra is to be of much more use than its progenitor for, in its present state, it is too slow for a first-line fighter and cannot be



With its Griffon XLV engine and Rotol 5-blade airscrew, the Spitfire XIV is probably the world's fastest fighting aircraft, and although having a lengthened nose and increased fin rudder chord to compensate, is still unmistakably a Spitfire.



This Sperry Attitude Gyro registers the altitude of the aircraft against a stable sphere with positive accuracy.

RETROSPECT

so much more manœuvrable as to give it advantage enough to outweigh this shortcoming.

A "new lamps for old" flavour seems appropriate to the closure of Hurricane production, and the introduction of the Tempest. The name of Hawker is assured an honourable place in aeronautical history by virtue of the Hurricane alone, and yet the Typhoon and the later Tempest are aircraft whose fighting records, young though they are, make them well worthy to stand side by side with their older brother. Tempests were first used operationally against the flying bomb, and, with their very thin wing and clean lines coupled with the 2,200 horse power of the Napier Sabre are very fast aircraft indeed. One of the more interesting technical features of the Tempest is the undercarriage which, due to the thin wings, is constructed with the main struts in two separate units joined by parallel-action links with the shock absorber unit spanning them. A neat solution to a tricky problem.

A machine for which there will doubtless be a healthy future is the civil conversion of the Anson, which can accommodate six passengers in excellent comfort with provision for a reasonable amount of luggage, and for an economical cruising speed of 150 m.p.h. has a still-air range of 400 miles on 140 gallons of fuel. Ansons have always had a first-class reputation for simplicity, reliability and safety, and for feeder line services it is difficult to visualise a more suitable machine.

Latest New Aircraft

The last new aircraft to come off the secret list was the Firefly, the latest Fairey contribution to naval aircraft, and, furthermore, a machine which is well equipped to carve a name for itself in the future. A Griffon II engine is used and Fairey-Youngman flaps, normally retracted into recesses in the underside of the inboard wing trailing edge, can be extended to a variety of settings for different flight requirements. The combination of very clean surfaces and lines together with a Griffon and the special flaps give the Firefly a great speed range and positive flying control at a very low speed. An unusual element of the layout is that the main fuel tank is located in the fuselage between the pilot's cockpit and that of the observer/radio operator; an excellent location in that the greatest disposable unit weight is very close to the aircraft's c.g., with consequent small effect on trim or manœuvrability.

Here is shown an R.P. Beaufighter with two of its rockets just leaving the launching rails. These projectiles accelerate throughout their trajectory and explode with terrific blast upon impact.

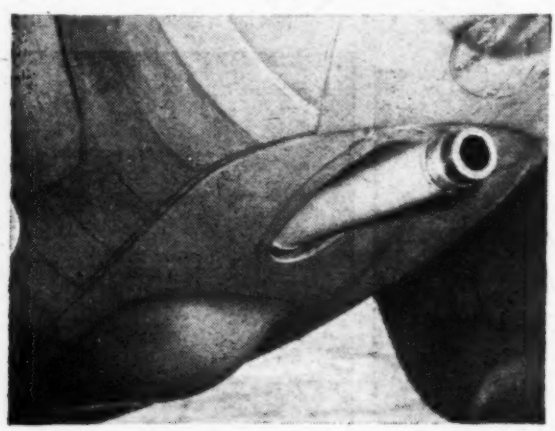
At the end of November came news of the Mosquito XVIII equipped with a 57 mm. quick-firing six-pounder gun in the belly of the fuselage. These aircraft, flown by squadrons of Coastal Command, have inflicted heavy damage on enemy U-boats, for a six-pounder shell is capable of a great deal of destruction, and the accuracy of the firing from these latest Mosquitoes has proven to be high.

Reaction propulsion is the prime element of two further technical advances made during the year, apart from the chief interest of jet propulsion for aircraft, and these are (1) the use of rocket projectiles launched from such diverse machines as Swordfish, Beaufighters and Typhoons, and giving a striking power said to be the equivalent of a broadside from a cruiser's 6in. guns; and (2) the use of rockets for assisting the take-off of heavily laden aircraft or, conversely, the very rapid take-off of normal machines. Experiments with rockets for assisting take-off have been going on for a considerable time, but it is only recently that the practice can be said to have graduated from the experimental class into that of common usage.

Radar has probably undergone as much development as any other item in the past year. Naturally, there is little that may be said about it, but the radio/electronic devices that our scientists have devised for the R.A.F. have contributed a tremendous amount to the effectiveness of our aerial forces. The equipment which enables our night fighters to pick-up and stalk their quarry, the equipment which gives navigators a picture of the ground beneath them, despite cloud; these are but two examples of the sort of thing British scientists have produced. We lead the world in this sphere, and a very good thing for the world, too.

British scientists also evolved the gyro gun sight, an improvement on the previous reflector sight in that the sighting graticule moves on the sight's object glass according to the movement of the attacking aircraft in following its target, and also expands and contracts according to the distance between the two machines. This quality of the sight allows deflection shots to be made with certainty at angles hitherto impossible of accuracy.

There have been many other achievements in the technical field of 1944 with which we have not the space to deal but which have been dealt with already in the appropriate issues of *Flight*.



The 57 mm. cannon housed neatly in the under fuselage of the Mosquito XVIII. These guns fire a 6 lb. shell and have done great damage to U-boats, so much so that their shore-going tactics have had to be radically changed.

Civil Aircraft Engines—II

Some Existing Types Examined, and a Few Suggestions for the Future : Multi-bank Radials, Contra-rotation and "Handed" Engines : The Ultimate in Civil Speed

By JOHN W. MORRISON

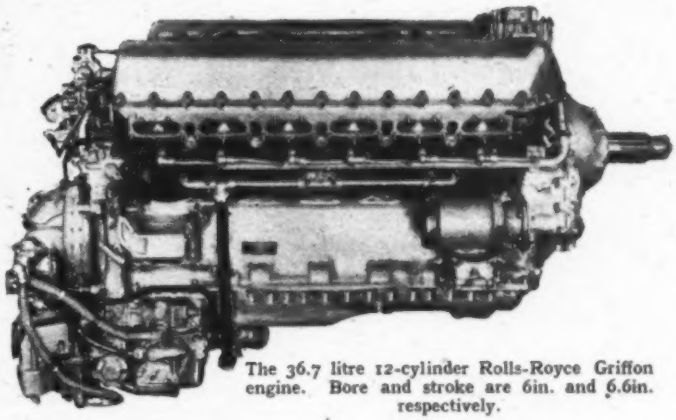
(*Continued from page 667*)

THERE has been a certain amount of surprised comment about the power plant of the Avro York. Since it is so widely admitted that air-cooled radials are more suitable for air transport than are liquid-cooled, in-line engines, why is it that the York does not mount Lancaster II (Hercules) engines? Sqn. Ldr. Potts (*Flight*, August 10th, 1944) has rather inferred that Hercules engines are unsuitable for air transport operation—a very extraordinary inference. So far as can be ascertained the Rolls-Royce Merlin has proved an eminently satisfactory installation for the York. In one special machine, it is understood, the engines have been de-rated somewhat from military ratings in the interests of safety and extreme reliability.

No information has thus far been forthcoming concerning the power plant of the Avro Tudor landplane, although drawings that have appeared in Avro advertisements recently show liquid-cooled engines with wing radiators for this low-wing pressurised machine. Since the Tudor is a bigger aircraft than the York, it is reasonable to assume that it will mount Rolls Griffon engines or a development thereof. The Griffon with single-stage two-speed supercharger is almost certainly the most suitable liquid-cooled engine in existence for civil operation, due to its copious swept volume (2,240 cu. in., 36.66 litres) with consequent high power per cylinder, without recourse to high boost pressures or high engine speeds.

Effect of Length

Although military requirements so often deflect engine design from the economic ideal, it is gratifying to be able to record an instance where this has not been the case. In the Griffon-engined Spitfire, the negative effects of too much overhang had to be countered by reducing the length of the engine by every conceivable means; hence the very moderate overall length of the Griffon for its power rating.



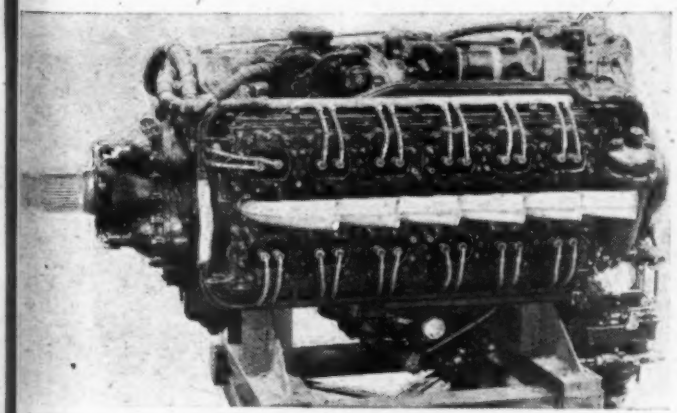
The 36.7 litre 12-cylinder Rolls-Royce Griffon engine. Bore and stroke are 6in. and 6.6in. respectively.

Reduced overall length not only cuts down engine weight, but also mounting weight. The surface area of the nacelle is decreased, which in turn results in a minute but nevertheless important reduction in total drag; wing structure weight also comes down. In commercial operation, the saving of those few inches would enhance revenue-earning capacity not a little.

In his Wilbur Wright Memorial Lecture Sir Roy Fedden mentioned an output of 1,750 h.p. for the civil-rated Griffon engine whilst anticipating a maximum of no less than 2,400 h.p. for military operation. Since 1,750 h.p. seems about the right power for most economic operation at reduced engine speed and moderate boost pressures, one may be justified in assessing specific output on this rating.

Take-off power: 1,750 h.p.
Power per cyl.: 146 h.p.
Piston area power: 5.16 h.p./sq. in.

The Bristol Hercules series of 14-cyl. radial engines are now in service throughout the Empire and in many foreign countries. In the writer's opinion any doubt re the suitability of the "Herc." for commercial operation may be dismissed without compunction. Prior to the outbreak of war, the 1,380 h.p. civil-rated Hercules IVc was applied to the Short "G"-class flying boat, and the VIc of 1,600 h.p. was specified for the Short transatlantic landplanes. The latter engine had an estimated fuel consumption of 0.42 lb./hp./hr. at maximum economic cruising speed at 10,000ft. My only criticism of the Hercules power plant relates to the high parasitic drag of the cowling; power-plant standardisation has had the effect of "freezing" the design of power eggs that might otherwise have been brought into line with modern practice. As revealed recently by Mr. Markham (*Flight*, September 28th, 1944), the Hercules engine is now in the 1,700 h.p. class.



Napier's latest, the 2,200 h.p. Sabre, is a 24-cylinder sleeve-valved twin-crankshaft engine of H formation. Cylinder dimensions are 5in. diam. bore and 4.75in. stroke.

Hotted-up DC-4s

A number of the best-known American airlines are to acquire Douglas DC-4 airliners within a few months of the cessation of hostilities. Certain of these machines will be suitably modi-

CIVIL AIRCRAFT ENGINES

fied to take Pratt & Whitney Double-Wasp 18-cyl. 2-row radial engines of something over 2,100 h.p. In addition to the above aircraft, numbers of modified Curtiss Commandos, also mounting Double-Wasps, will be made available for civil operation. The total number of Double-Wasps now in service cannot be far short of the 100,000 mark. As will be seen from the figures given below, the specific output of the Double-Wasp is comparatively moderate.

Take off power: 2,100 h.p.
Power per cyl.: 117 h.p.
Piston area power: 4.5 h.p./sq. in.

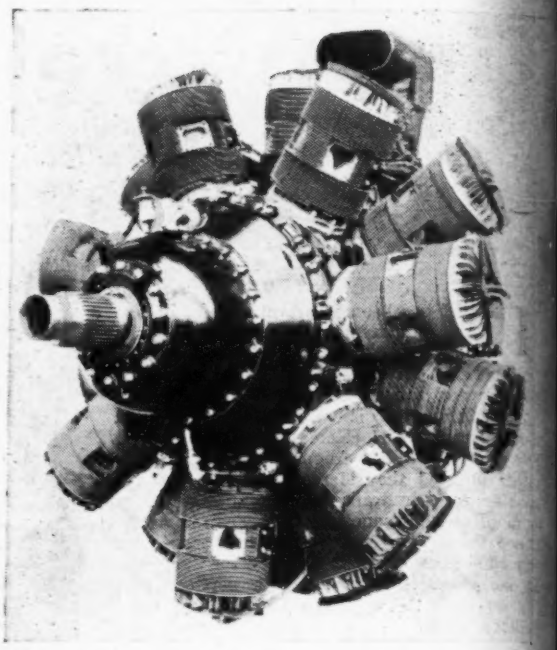
For long-range civil development, the Napier Sabre double horizontally opposed arrangement of 24 cylinders with sleeve valves, has excellent possibilities. With very large cylinder dimensions, the Sabre arrangement could be developed for submerged wing installations with good all-round accessibility in flight, even if extension shaft length restrictions dictated that the engines be suppressed in the leading edge section of the mainplane. In purity of design philosophy and individuality of conception, the Napier Sabre is one of the classic engines of our time.

A number of engines in the 3,000 h.p. class are already in existence; one of these, the Double-V, 24-cyl. Allison, is in production. The Double Allison has been under development for the better part of a decade; the design provides for a high degree of interchangeability with the well-known V-1710 series, and the unit delivers 1,000 h.p. per foot of depth and has a commendably moderate overall length, all of which suggests possibilities for wing installation. Since the V-1710 engines are available with right and left-handed rotation, it is possible that a contra-rotating Double Allison could be developed to drive contraprops without the complication and loss of efficiency inherent in reverse gearing.

DC-7 Performance

The Douglas DC-7 airliner is likely to be the first civil machine to go into service with 3,000 h.p. engines. Extraordinary claims have already been made for the DC-7. It is said to have a top speed of 400 m.p.h. and an absolute ceiling of 40,000ft., the latter claim rather presupposes the inclusion of exhaust turbos. The even more startling Consolidated-Vultee monster, which is claimed to seat 400 passengers, will need engines of considerably more than 3,000 h.p.

Since high wing loadings and heavily stressed structures may well render submerged power plants impracticable for any aircraft of less than 300,000 lb. gross weight, it may be that the two-row radial of 3,000 h.p. would be quite acceptable, despite its considerable frontal area, as forward retraction of the undercarriage in a 70-ton aircraft would call for a firewall diameter of 6ft.

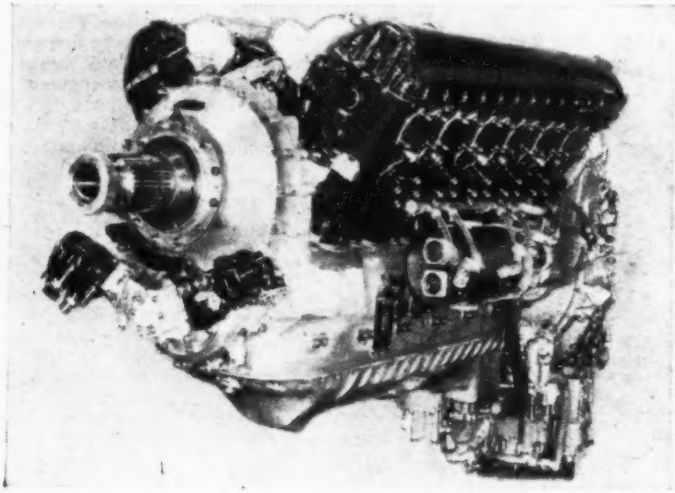


The well-tried Bristol Hercules which gives a take-off power of 1,600 h.p. Diameter is only 52in. Cylinder bore is 5¾in. and stroke 6¼in.

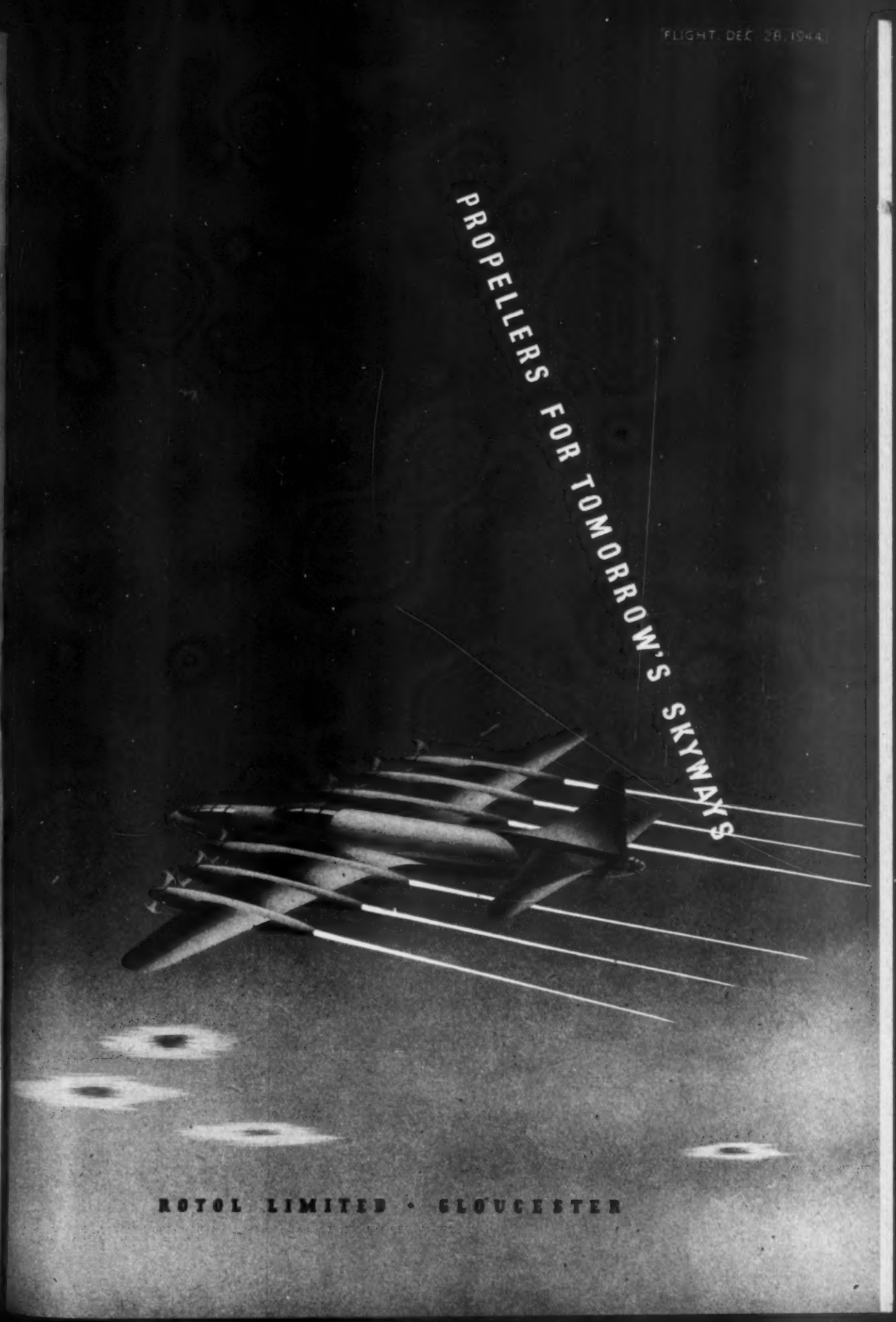
Air-cooled 28-cylinder multibank radials are known to be under development in several different countries. The German B.M.W. concern is reputed to have produced a multibank of the 28-cyl. type for installation in a high-performance twin-engined bomber. The old-established concern of Gnome et Rhône has also built a 28-cyl. multibank radial, reported to develop 3,500 h.p. The original conception of the 28-cyl. multibank was that of seven four-in-line banks of cylinders radially mounted. With this arrangement, zero inertia torque variation (even firing of all cylinders) was very nearly realised, but it would be necessary to cool the engine as seven separate four-in-lines. In the Gnome multibank, two 14-cyl. radials are placed one behind the other, the engine presumably being cooled by both normal and reverse-flow cooling with central air exit. Sir Roy Fedden had proposed a spiral 28-cyl. multibank with direct cooling to all cylinders and special crankshaft.

Owing to the extreme difficulties likely to be encountered in designing a suitable multibank built-up crankshaft more than a yard long, which would have eight sections joined together with four Maneton and three Hirth joints calling for extraordinarily accurate machining operations and assembly, some engineers have thought it prudent to revert to a one-piece crankshaft with split master connecting-rods and two-piece crankcase, design features not normally associated with high-duty radial engine practice.

Because of the great length of the multibank when compared with other radials, it is unlikely that a tubular mounting at the rear of the engine would prove satisfactory, a possible solution would be a monocoque cowling, similar



Threequarter front aspect of the 1,280 h.p. Rolls-Royce Merlin XX engine. A two-stage supercharger enables maximum power output to be delivered at 21,000ft.


PROPELLERS FOR TOMORROW'S SKYWAYS
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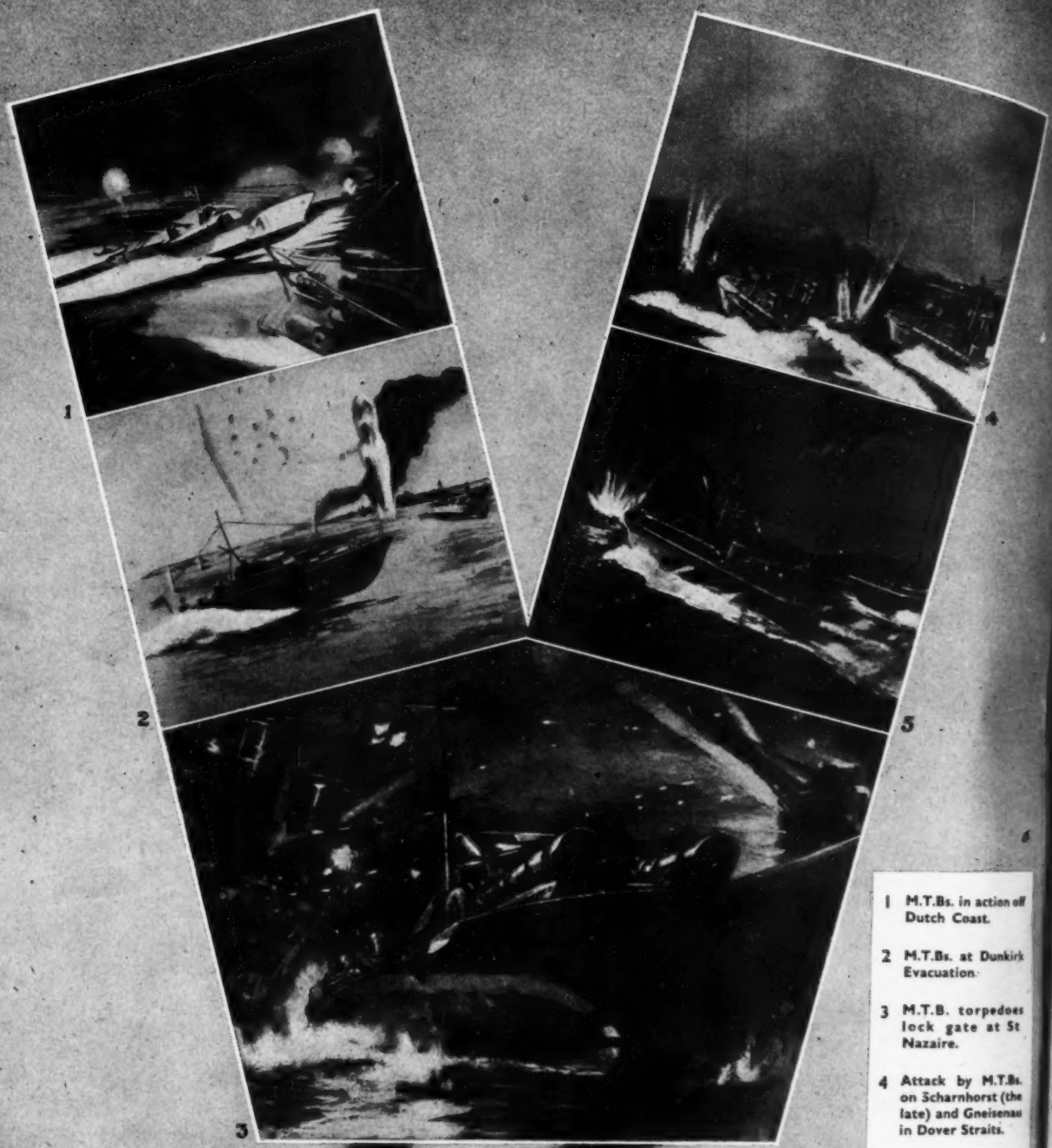


1 M.T.Bs. in action off Dutch Coast.

2 M.T.Bs. at Dunkirk Evacuation.

3 M.T.B. torpedoes lock gate at St Nazaire.

4 Attack by M.T.Bs. on Scharnhorst (the late) and Gneisenau in Dover Straits.

5 M.T.B. sinks "U" Boat in Straits of Sicily.

VOSPER

MOTOR TORPEDO BOATS

CIVIL AIRCRAFT ENGINES

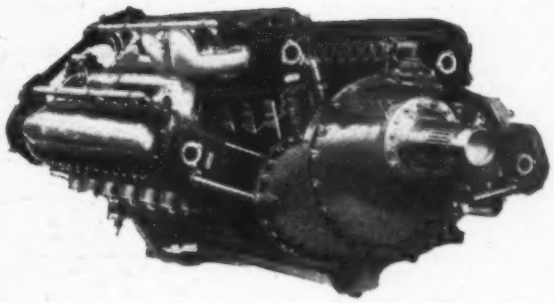
to that used for the dynafocal mounted engines of the Douglas B-19 bomber, with small access covers to the cylinder heads and giving forward support to the engine. In very large aircraft with ganged 28-cyl. multibank engines in the leading edge section of the wing, and right angle drive, the mounting problem would be simplified, as the engines could be supported fore and aft with brackets from the front spar.

Successful development of the 28-cylinder air-cooled multibank radial would undoubtedly constitute the greatest engineering achievement in the history of the piston-type petrol engine: the last and most complex stage in the evolution of the air-cooled radial and the greatest number of cylinders acting on to a single crankshaft. Economic power range of the 28-cylinder multi-bank would extend from 3,500 h.p. to 4,500 h.p.

Cowling of certain radial engines has improved to such an extent that there is now little to choose between air and liquid cooling on the score of drag. A tendency away from circular cowls has been noted in the case of 14-cylinder and 18-cylinder radials where it is desirable to contain air intakes, oil-cooler intakes and possibly intercooler intakes within the lines of the complete nacelle. In two-row radials with forward-facing exhaust system there is quite a good case for the diamond elliptical section cowl (horizontal major axis) as this particular shape permits of side integral air intakes and side disposal of exhaust gases with the maximum gain in thrust; also, enhanced simplicity of feeding twin nacelle-recessed turbos. For utmost efficiency, oil coolers should be submerged within the leading-edge section of the wing.

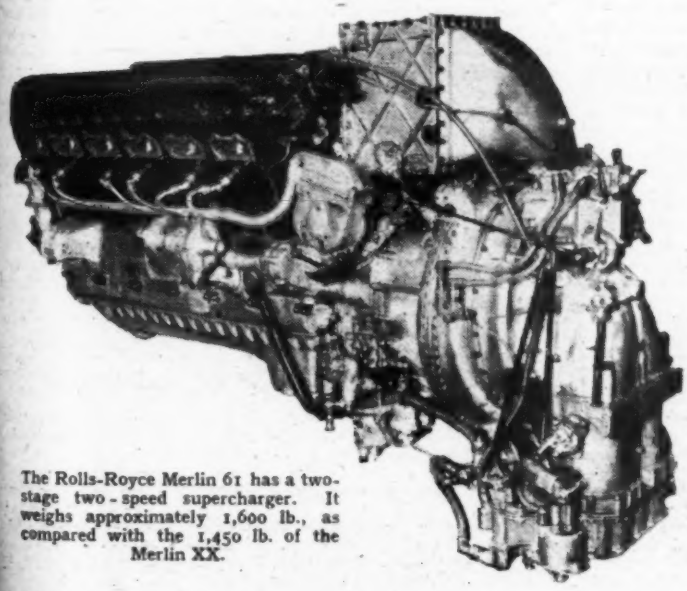
Interchangeability Losses

Liquid-cooled power plants for heavy aircraft that have been designed for interchangeability with large radials have lost heavily on the score of efficiency; the greater the degree of interchangeability and standardisation, the more obvious the loss becomes. There are three main causes for these losses; first of all, the greater drag and spoiling of the lift due to the large-diameter firewall—often 50 per cent. greater than is necessary; secondly, the increased weight of the larger nacelle; and thirdly, the increased forward moment due to the positioning of the radiators and oil-coolers in the power egg. It goes without saying that liquid-cooled engines which have been designed at great cost and labour for the smallest possible frontal area and tightest cowling should be installed as was originally intended whenever and wherever the opportunity presents itself. To reduce drag and overhung weight, radiators, oil coolers and possibly air intakes should be disposed within the leading-edge of the wing. The firewall should then be recessed slightly into the leading edge. The installation of the Sabre engine in the Napier Heston racer has impressed me as just about the last word in high-efficiency cowling and cooling. Had this machine been developed as a P.R. type or lightly armed fighter, we might well have had a 500 m.p.h. plus orthodox aircraft in service on the fighting fronts.



In the 3,000 h.p. class. The double-vee 24-cylinder Allison liquid-cooled engine, now said to be in production.

Provision for high-altitude operation is now deemed essential in all civil aircraft except those operating at short range. Although the turbo-supercharger is likely to be the final answer in so far as very-long range transatlantic aircraft are concerned, the two-speed single-stage blower in its most efficient form is capable of meeting requirements for aircraft having operational altitudes of from 15,000ft. to 20,000ft. without prohibitive increase in economic consumption. It is generally found that by reducing engine speed to 75 per cent. of maximum economic cruising power in weak mixture and "S" blower, the decrease in specific consumption is more marked than for a similar decrease in "M" gear. The specific weight penalty of a two-speed supercharger installation varies very considerably from one engine to another. A study of all available data relating to comparable single- and two-speed engines shows that the weight of an engine may increase from less than 3 per cent. to more than 10 per cent. as a result of incorporating a two-speed blower. In a number of engines there is a strong suggestion that the two-speed gear weight is altogether inordinately high.



The Rolls-Royce Merlin 61 has a two-stage two-speed supercharger. It weighs approximately 1,600 lb., as compared with the 1,450 lb. of the Merlin XX.

Engine Life and Speed

The airline operator nearly always decides whether or not it may be desirable to derate a military engine for civil usage in the interests of greater safety and longer overhaul life. A reduction in engine speed of from 4 per cent. to 5 per cent. should have the effect of extending overhaul life not a little. If rated height for maximum level power be capable of reduction, as is sometimes the case, loss of take-off power in the derated engine will be negligible. A rated height of 500-1,000ft. in "M" gear is about right for civil operation.

Due to production considerations, a range of reduction gear ratios is not provided on a number of engines. In many instances, the optimum ratio cannot be selected until such time as the engine firm has particulars of the proposed aircraft. The Cunliffe-Owen transport (two Perseus XIVc motors) was a typical case. Due to increased solidity of airscrews and possibly a slight decrease in maximum

engine speeds, there is the suggestion that alternative higher reduction gear ratios will be needed.

The negative impact of large airscrew diameters on aircraft design is too well known to require further comment here. Good progress has been made in the direction of higher disc loadings with increased number of blades and wider blade chords that can react favourably on future designs if intelligently applied. Some falling away of airscrew efficiencies will be the inevitable penalty, but this can be minimised by careful selection of gear ratios. The advantages of hollow steel blades are becoming more apparent.

CIVIL AIRCRAFT ENGINES

Standardisation of engine pick-up points without any reference to the special needs of nose wheel undercarriages is likely to produce difficulties in some new designs unless the engine firms can see their way clear to widen pick-up point spacing. Although the decision to standardise pick-up points was admirable in its way, it is patent that design requirements are constantly changing in a manner that makes standardisation and interchangeability difficult or even impossible of realisation without seriously compromising efficiency and economy in operation.

Need for right- and left-handed rotation of airscrews in certain types of twin-engined aircraft to prevent swing at take-off, enhance minimum single-engine performance and improve control generally, is becoming more apparent. The Lockheed Lightning and Grumman Skyrocket are likely to be joined by other types in the future. The airline operator might not take kindly to the idea of oppositely rotating airscrews should that involve doubling the number of spare engines; however, it may be worth investigating further the practicability of effecting right- or left-handed rotation by shifting cams and altering ignition setting. Alternatively, changes in direction of rotation might be effected solely in the reduction gearing. Obdurate opposition of officialdom obsessed by the standardisation mania has had an injurious effect on the development of right- and left-handed engines in this country.

International Type-tests

Type-testing of aircraft engines appears to differ appreciably in severity from one country to another. It has been claimed by a leading American authority that American and Russian type-tests are more searching than those of Britain, France and Germany. To render secure the economic merit of future British civil engine designs it will be most essential to evolve new type-tests calculated to establish longer periods between overhauls and better all-round economy in service. For certain advanced testing there is something to be said for mounting power plants on a specially made test section of the wing of the intended aircraft in way of engines so that flying conditions can be more nearly simulated and certain installation teething troubles may be sorted out many months in advance of the completion of the aircraft. There is any amount of evidence to show that such a procedure could accelerate the delivery of the aircraft. In the case of a wing-submerged installation, it would be essential to carry out extensive tests on engines, transmission system and separate reduction gear within the envelope of the intended wing section.

Introduction of jet propulsion and rocket propulsion for high-performance military aircraft has, almost overnight, rendered the conventional reciprocating-engined fighter, the so-called high-speed bomber and the unarmed P.R. machine slightly out of date, due to the greatly enhanced performance imparted by the former means of propulsion. However, if we are to believe the aerodynamic experts, the onset of the compressibility stall at speeds in the order of 500-550 m.p.h. at sea level will produce a tremendous increase in drag and a sudden collapse in lift, which will automatically prohibit further increases in speed. Some years ago several independent authorities all estimated that the highest possible speed attainable by conventional-powered pusher aircraft to be in the region of 560 m.p.h. at the lowest possible altitude.

Hypothetical Fighter

In the military sphere, the highest possible speed (reciprocating engines) may be attained with a twin-engined pusher P.R. machine or short-range fighter. In such an aircraft two liquid-cooled engines of 2,500 to 3,000 h.p. would be turned back-to-front on the L.E. of the wing, recessed into the wing as far as the front spar would allow, and the drive taken by means of extension shafts 6ft. to 8ft. long immediately below the wing to separate reduction and contra-rotation gear driving contraprops. Due to the absence of forward obstructions on the cowling, main cooling elements would be conveniently disposed in the nose of the nacelle immediately forward of the supercharger. This type of installation would have the merit of permitting the employment of a wafer-thin low-drag aerofoil section with no big cut-away in the skin of the heavily loaded torsion box. Such an aircraft would have a mean speed of 550 m.p.h. from ground level to 25,000ft.

Finally, we come to the highest practical speed attainable in a civil aircraft capable of economic operation. Before the outbreak of war an American authority suggested a maximum speed of 470 m.p.h. by 1950. If we consider an operating range of 1,200 miles, and an engine installation generally similar to the one already described, but having four engines and longer extension shafts, say 10ft.; a mid-wing arrangement and the smallest possible fuselage capable of seating 40 passengers, the whole machine having surpassing aerodynamic merit, the highest possible speed would lie between 480 and 500 m.p.h. Such a velocity would be sufficient for bloc-to-bloc speeds of the order of 400 m.p.h. with a normal flight duration of three hours. In both the above cases the compressibility stalling effects and not the method of propulsion are likely to prove the real limiting factors.

R.O.C. MASTER TEST

THE Royal Observer Corps is still carrying on its invaluable work of watching the skies to give warning of the approach of hostile aircraft. In 44 cinemas throughout Britain, 6,500 observers recently sat for the Royal Observer Corps first-class proficiency and master test, the climax to their year's voluntary study of aircraft recognition. Only members of the Corps who had passed the basic and intermediate tests since January, 1943, were eligible for the master test, and the fact that there were 2,000 more candidates than last year shows that after five years of war, and in the absence of any recent enemy aircraft activity, their enthusiasm is still maintained.

The test comprised 100 flying views of British, American and German aircraft and lasted approximately 35 minutes. Each view was shown for three to six seconds, and the candidates had ten seconds to write down the identity of the aircraft. It is estimated that 126,000ft. of film was used in showing the test at the 44 cinemas, the majority of which were lent for the occasion.

A high standard was set, and although every candidate gaining 80 per cent. and over qualified for the first-class proficiency certificate, signed by Air Commodore Finlay Crerar, C.B.E., Commandant of the Corps, only those with 90 per cent. and over were classified as masters and privileged to wear the master test badge, which is a Spitfire printed on a cloth background and worn on the sleeve. Last year 71 observers won this badge.

R.A.F. LIBRARY LENDS A HAND

COACHING for the inter-R.I.B.A. examination at a cost to the student of 10s. and the free loan of all the books necessary for the budding lawyer to take his LL.B. degree, are examples of the service offered by the R.A.F. central library to airmen and airwomen to prepare for post-war careers.

In one recent month the library sent out over 3,200 parcels of books. A service has already ben established to Western Europe, and students are tackling subjects as diverse as diesel engines and colloquial Hungarian.

CIVIL AVIATION NEWS

PARLIAMENTARY INTEREST

YET another White Paper on Civil Aviation may be soon published. Replying to a question in the House, Mr. Eden stated that he would consider the suggestion for the publication of a White Paper dealing with the Chicago Conference issues. The question of debating the subject in the House, he said, would be considered when the Minister for Civil Aviation returned from the U.S.

LOOKING AHEAD

FLEETWOOD councillors displayed a courageous and air-minded attitude. Despite the opposition from the neighbouring authorities of Garstang and Preesall, the council unanimously adopted the decision to proceed with its proposal to recommend the establishment of an international air port in the district.

AIRPORT FOR MANCHESTER

A CALL for an airport at Manchester with adequate facilities to provide direct and speedy services to and from overseas markets was made to Lord Swinton by the directors of the Manchester Chamber of Commerce.

The Board expressed the conviction that plans should now be developed to ensure an adequate provision for the post-war air transport needs of the trading community.

A NEW ORGANISATION

AN Association of British aircraft operators has been registered as a limited company without capital.

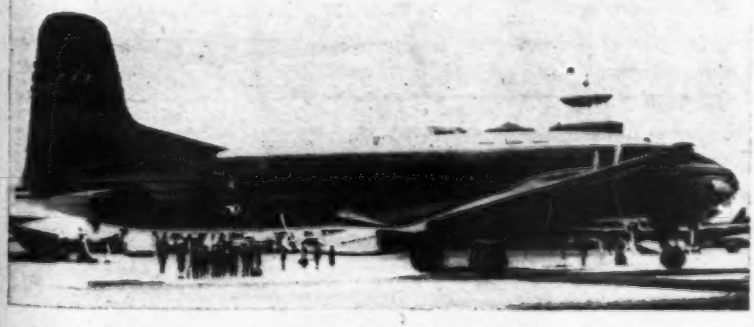
The names of the council members of the Association are: R. T. Boyd (director, Atlantic Coast Air Lines, Ltd.), W. R. Bradbury (director, Isle of Man Air Services, Ltd.), Hon. Mrs. M. M. Bruce (Air Dispatch, Ltd.), Caroline Brunning (Aberdeen Flying School, Ltd.), S. J. Cox (Straight Corporation, Ltd.), A. M. Desoutter (managing director, Airports, Ltd.), and E. L. Gandar Dower (managing director, Allied Airways).

RAIL-SEA-AIR LINK

THE railway companies' offer of partnership in their rail-air plan for the U.K. and Europe has been accepted by nine short sea liner companies.

These companies, the British and Continental Steamship, Ltd., Brussels Steamship Co., Ltd., Clyde Shipping Co., Ltd., Coast Lines, Ltd., Ellermans Wilson Line, Ltd., General Steam Navigation, Ltd., MacAndrews, Ltd., Ulster Steamship Co., and United Baltic Corp., operated before the war between Britain and European ports or within the U.K. on regular schedules similar to those of the steamships of the railway companies.

It will be remembered that the principal feature of the rail-air plan submitted to the Government in October last consisted of the offer to operate a comprehensive air services network in the United Kingdom and to Europe without subsidy, on condition that no other British or foreign line is subsidised against them, and for this purpose to develop with the shipping interests a separate airline company with staff experienced in air transport.



SCALE MODEL: The DC-7, one of Pan American Airways' post-war transports, cruises at 296 m.p.h. at 20,000ft. With a take-off gross weight of 162,000 lb. it will carry a maximum of 108 passengers, or 95 day and 79 on night transatlantic services. Cargo capacity is 1,169 cu. ft.

ALPINE TYPE

THE Swiss Airways have put into service a new passenger aircraft specially designed for mountain terrain.

The new aircraft has a short take-off and landing run, carries five passengers, and has a maximum speed of 145 m.p.h.

TO CONGO

TWO monthly return services between Miami and Leopoldville (Belgian Congo) are to be operated by Pan American World Airways.

Covering 7,269 miles, the route is to extend from Miami to San Juan; Port of Spain, Trinidad, Belem and Natal, Brazil over the South Atlantic to Monrovia and across the Gulf of Guinea to Leopoldville. Duration of a trip: five days.

AFRICAN AIRWAYS

SOUTH AFRICAN AIRWAYS will operate a once-weekly return service between the Rand and Salisbury, capital of Southern Rhodesia. The schedule provides for alternative interim calls at Durban, Bloemfontein, and at Kimberley.

Lockheed Lodestars are to be employed on this service.

Also announced is a daily Rand-Durban service on which for the present official passengers will have priority, but provision will be made for the public as machines are freed and available.

COLLABORATION

A CONTRACT signed by the Directors of Air France during the occupation has been found among Vichy Government records. Under it 66-years-old General Bertrand Pujo, former President of the Board and Director of Air France, and later Under-Secretary of State in the Petain-Laval Government, who was arrested together with fellow-directors, undertook, for the duration of the war, to place at the disposal of *Lufthansa* all the facilities—aircraft, engines—which existed and any which might later be added belonging to Air France.

A French Air Ministry communiqué dealing with the arrest of General Pujo and his accomplices on charges of trading with the enemy, states that over 80 French transport aircraft built of the best French material were handed over to the enemy as well as the entire stock of spare parts, which they were not entitled to offer or to sell to anyone.

A further announcement issued by M. Charles Tillon, the French Air Minister, states that the Air France Company has been requisitioned and its council of administration arrested on charges of delivering nearly all its equipment to the Germans.

STRIPS

PLANS to build 300 airstrips at municipalities throughout Canada with a population of over 2,000, were outlined recently by Russell L. Gibson, president of Cub Aircraft of Canada, Ltd., Hamilton, Ont. The plan calls for airstrips up to 3,000ft. long and 200ft. wide, with turf or concrete surfaces.

SECURING A JUNCTION

OFFICIAL announcement was recently made at Ottawa that Canada has signed a 99-year lease on Goose Bay airport, Labrador, with Newfoundland. The lease covers only military operations. Canada began to build Goose Bay airport late in 1941 at a cost of $25,000,000. The airport used by British, United States and Canadian air forces, is operated by the Royal Canadian Air Force. It covers 120 square miles of area, and will be important in post-war transatlantic traffic.

PICK-UP COMBINATION

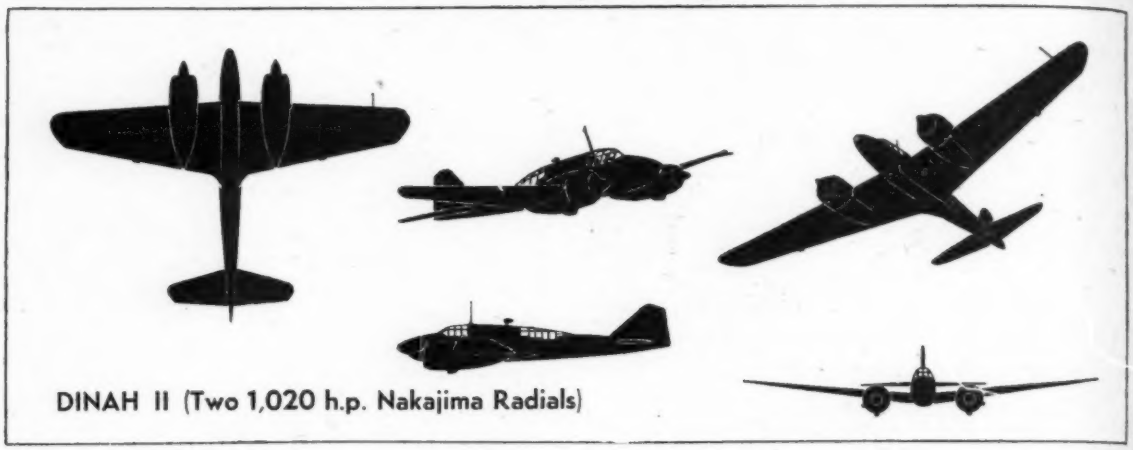
POSSIBILITIES of a combined passenger-pick-up gear-equipped aircraft were described by the chief engineer of All-American Aviation Company.

The plan foresees landing only when necessary to take up or disembark passengers, while mail and express freight would be picked up and delivered in flight.

In equipment requirements specialised aircraft are foreshadowed of a cruising speed of 175 m.p.h. and controllable at 80 m.p.h. The gross weight of such aircraft to be 15,000 lb., allowing for twelve passengers and their luggage, a crew of two, 300 lb. of express through-freight, 200 lb. of pick-up gear weight, 1,500 lb. pick-up freight capacity and fuel for a 500-mile range with the usual margin.

Studies in Recognition

Aircraft in Flying Attitudes

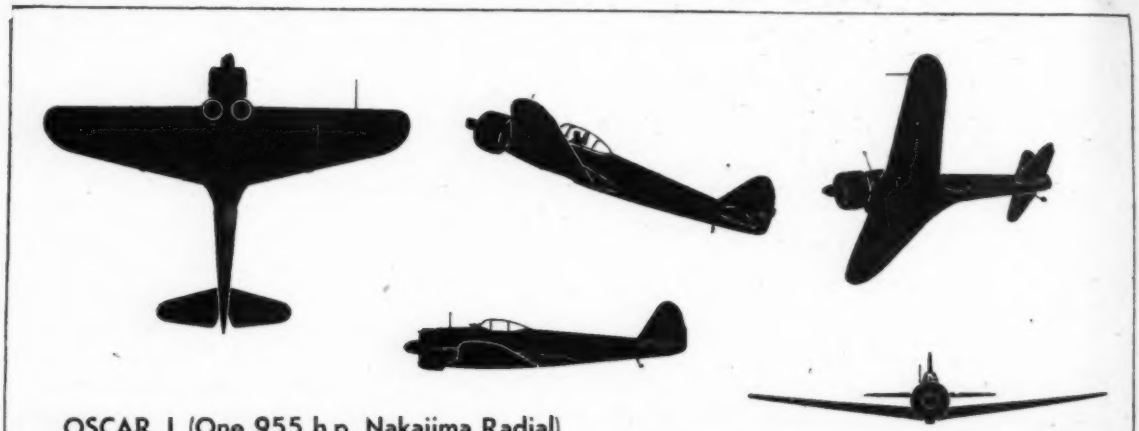


DINAH II (Two 1,020 h.p. Nakajima Radials)

PRODUCED by Mitsubishi and known to the Japs as the *Shintei*, Dinah II is a photographic reconnaissance aircraft in the same relative category as our Mosquito, though its performance is less brilliant Powered by a pair of 1,020 h.p. 14-cylinder, air-cooled Nakajima radials, its top speed is 348 m.p.h. at 17,600ft., and its service ceiling 36,300ft. A later version with Mitsubishi Type 02 engines, however, has a top speed of 370 m.p.h. at 23,000ft. Like the P.R. Mosquito, it is normally unarmed.

The low-wings with dihedral from the roots taper more on the trailing-edge while the tailplane tapers more on its leading-edge; both have raked and rounded tips. The slim two-seater fuselage has separate tandem cockpits and the angular fin and rudder has an abnormally broad base. Dimensions: Span 48ft. 3in., length 36ft. 1in.

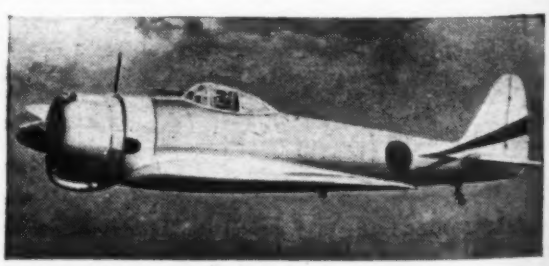
Dinah II, 2-seater P.R. Mitsubishi



OSCAR I (One 955 h.p. Nakajima Radial)

ALTHOUGH two later Nakajima army fighters, Tojo and Tony, have appeared since Oscar first went into service, the latter is still being used in considerable numbers. It is powered by a 955 h.p. 14-cylinder Nakajima air-cooled radial engine and has a top speed of 317 m.p.h. There is also a Mark II version which has the 1,020 h.p. Nakajima engine and a top speed of 342 m.p.h., but is virtually identical for recognition purposes. The Oscar was first seen in action on the Burma front acting as bomber escort. Bombs or long-range tanks may be carried under the centre-section.

Chief recognition points of the Oscar fighter are the almost straight leading-edge with pronounced trailing-edge taper, round tips, and dihedral from the roots, straight tapered tailplane, and long, slim fuselage with teardrop cockpit cover. Dimensions: Span 37ft. 9in., length 29ft. 2in.



Oscar I, Single-seater Nakajima fighter

On the ONE *hand . . .*

A problem picture? Well, so it is. Which Stop Nut is the better? The Simmonds Nut after ten years of faithful service to the aircraft industry, now faces strong competition from the same stables (if we may use such a term to describe our somewhat modern Works and Offices). The competitor, of course, is the Pinnacle — the metal diaphragm Stop Nut. To be quite honest, we ourselves think that the Pinnacle will (and should) supersede the Simmonds for many purposes. But not for all. The good old Simmonds nut has still plenty of useful work to do that no metal diaphragm stop nut can do so well — not even its stable mate the Pinnacle. If you are in any doubt about which to choose, when, and for what purposes, have a word with us. We make both types and, what is just as important, have long practical experience of both types. Talk to us at the blue print stage and maybe we can help you to avoid a lot of later headaches in the production lines.

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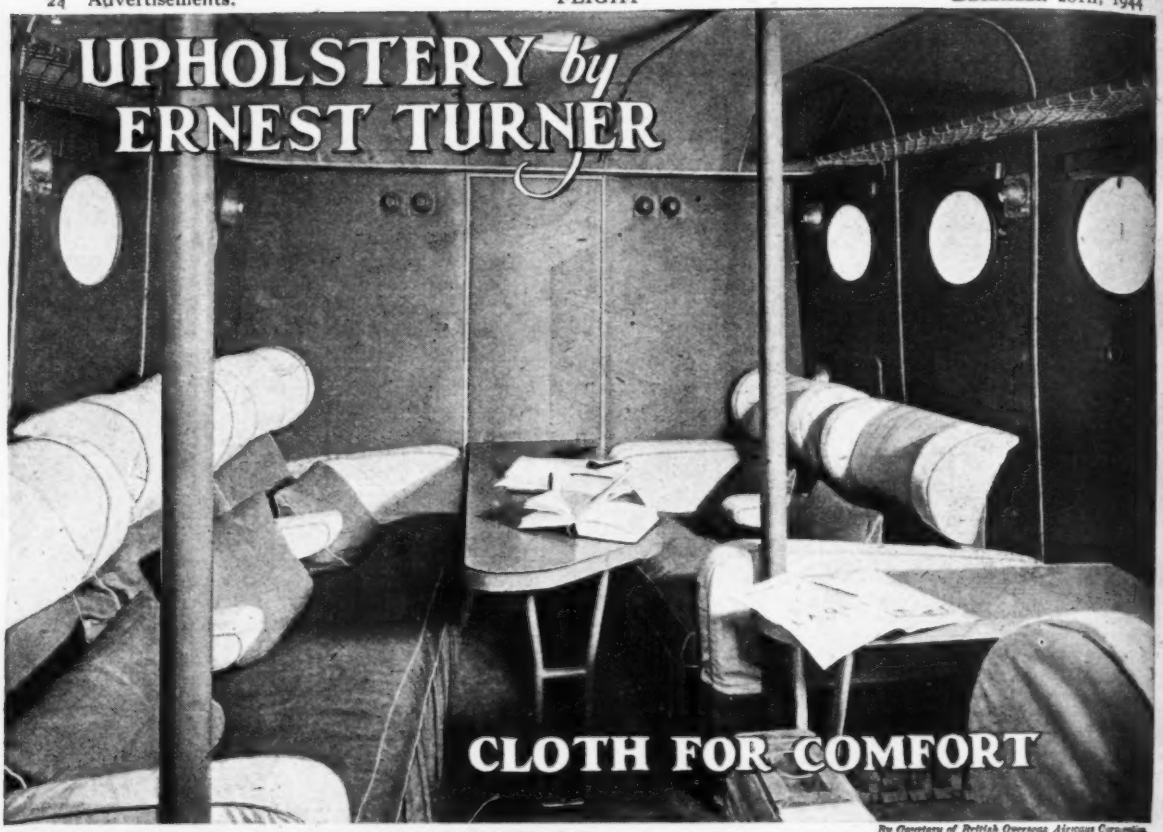

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The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers not necessarily for publication must in all cases accompany letters.

AIR ARM OR AIR WEAPON
Must We Re-learn Old Lessons?

I HAVE only just seen the Editorial in your issue dated December 7th, 1944, entitled "An Arm or Air Weapon." You are to be congratulated on bringing into prominence one of the long-standing difficulties encountered by Fleet Air Arm airmen, namely, that the Navy insists upon regarding them as seamen first and airmen second.

The accepted fact that the success of a sea service depends upon the efficiency of its seamen lends emphasis to the similar proposition that an air force must have airmen—professional airmen and not amateurs.

The possibility must by now be dawning upon the minds of many people that the careers of the airmen—whether flying from shore or ship bases—would be better catered for if they all formed part of one Air Force.

Is the question to which attention is drawn in your article an indication of the problem which has arisen as the result of the tendency (unobtrusive but definite, and which started shortly before the war) to depart from the principle of a centralised Air Force? Are we now committed to re-learning laboriously the lessons of the last twenty-five years?

"INQUIRER."

Sailing Boats Promote Good Comradeship

AS the "naval correspondent" to whom you refer in your editorial of December 7th, perhaps you will allow me to express my surprise at your hostility to the suggestion that all naval officers should learn to fly. A certain school of air enthusiasts, among which *Flight* can be included, has often accused naval officers of being insufficiently air-minded. Yet the suggestion that they should all become air pilots you seem to think outrageous. Surely you are hard to please.

Your own suggestion, though made, I fear, with sarcastic intent, that Fleet Air Arm officers and airmen should be taught to sail boats is actually a very good one. In many years' experience at sea I have always found a common ability to sail boats one of the best methods of promoting good feeling between the different branches of the Navy: seaman, engineering, accountant and Royal Marine. You would not, I take, oppose the cementing of good comradeship between the Fleet Air Arm and the officers and men of the ships in which they have to serve.

On the important question of whether air power is a third arm or an extra weapon, you are naturally entitled to your own opinion. But it can at least be said that if you are right in favouring the former alternative, almost all the important countries other than Britain are wrong. It is a case of the whole world being out of step except *Flight*.

RUSSELL GRENFELL (Capt., R.N.).

[Capt. Russell Grenfell's letter shows how necessary was *Flight's* leading article, "An Arm or Air Weapon," to which he refers. There was no suggestion that we thought it a bad idea for sailors to fly and for airmen to sail. What we inferred was that all high command in the Royal Navy is recruited from the "sailors'" side of the service, and that the mere ability to fly cannot make air strategists any more than dinghy sailing can make airmen into naval strategists. Both are subjects for life study, and there should be a high command of each, in his last paragraph, Capt. Grenfell is quite at sea. Britain has used air power to the admiration of the rest of the world. Many other air forces would come out from under the thumbs of the older services if the powers which control them showed less self-interest in the matter.—ED.]

THE AIR AND SHIPPING
A Misunderstanding Explained

PARDON this belated comment on the letter (*Flight*, Nov. 16th, 1944) from Mr. Ronald Braden as to the members of C.I.A.T.O. I based my remarks on this resolution, taken from the proceedings of the meetings held on May 2nd, 3rd and 4th last, Lord Grimthorpe in the chair:

"That the meeting decides to constitute a Conference to represent the views and study the interests of international air traffic operators"

which was put to the meeting by the chairman. "The resolution was carried unanimously," quotes the document of the proceedings.

Further, in the June (No. 1) Bulletin of C.I.A.T.O., Lord Grimthorpe writes (page 3):

"The Conference was an unqualified success and all those attending were much struck by the spirit of good fellowship and friendly co-operation shown by speakers from many different countries. *All resolutions after very full discussion were passed unanimously*, and . . . " etc., etc.

Air Dispatch Ltd., Overseas Transport Co., Ltd., Western Airways, Ltd., and British Latin American Air Lines, Ltd., appear in the list of air lines present at the meetings, and I, and others, concluded that the foregoing quotations warranted the belief that they assisted in constituting a Conference and became members, in fact, of C.I.A.T.O.

The October (No. 2) Bulletin, appearing after my comments (*Flight*, Nov. 2nd, 1944) had been submitted, does give the list of actual members, omitting those four specified above.

"MACVIATOR."

JET EFFICIENCY
Another Formula Suggested

I HAVE read your articles on jet propulsion and gas turbines with great interest, and I have my own original ideas on this subject. I have noted that the formula given by J. K. de Havilland for the efficiency of propulsion of a jet as

$$\text{Efficiency of Propulsion} = \frac{2}{2 + R}, \text{ where}$$

$$R = \frac{\text{Slip speed}}{\text{Forward speed}}$$

I cannot agree with this formula.

Let us consider a rocket to be kept in motion at a velocity v_1 in a straight line by a series of explosions within it; let the speed of the gases issuing from the rear end of the rocket be v_2.

It is evident that at each explosion the exploding gases could be considered as if of two portions:—viz., a portion moving forward at a velocity v_1 and a portion moving backwards at a velocity v_2. The forward-moving gases impart their kinetic energy to the rocket before they ultimately emerge from the explosion chamber. If the masses of the portions of gas moving forwards and backwards, are m_1 and m_2 respectively, then it follows that $\frac{m_1}{m_2} = \frac{v_2}{v_1}$, i.e., $m_1 = m_2 \cdot \frac{v_2}{v_1}$

Now the kinetic energy of the forward-moving gases $= \frac{1}{2} m_1 \cdot v_1^2$; and the kinetic energy of the backward-moving gases $= \frac{1}{2} m_2 \cdot v_2^2$.

Hence the total kinetic energy $= \frac{1}{2} m_1 \cdot v_1^2 + \frac{1}{2} m_2 \cdot v_2^2$.

$$= \frac{m_2 \cdot v_1^2 + m_2 \cdot v_2^2}{2v_2}$$

As I deduced before, the kinetic energy of the forward-moving gases is imparted to the rocket before the gases leave the rocket chamber.

Whence efficiency of propulsion $= \frac{\frac{1}{2} \cdot m_2 \cdot v_1^2 / v_2}{(m_2 \cdot v_1^2 + m_2 \cdot v_2^2)/2v_2}$

$$= \frac{v_1^2}{v_1^2 + v_2^2}$$

This could be written in the form:—

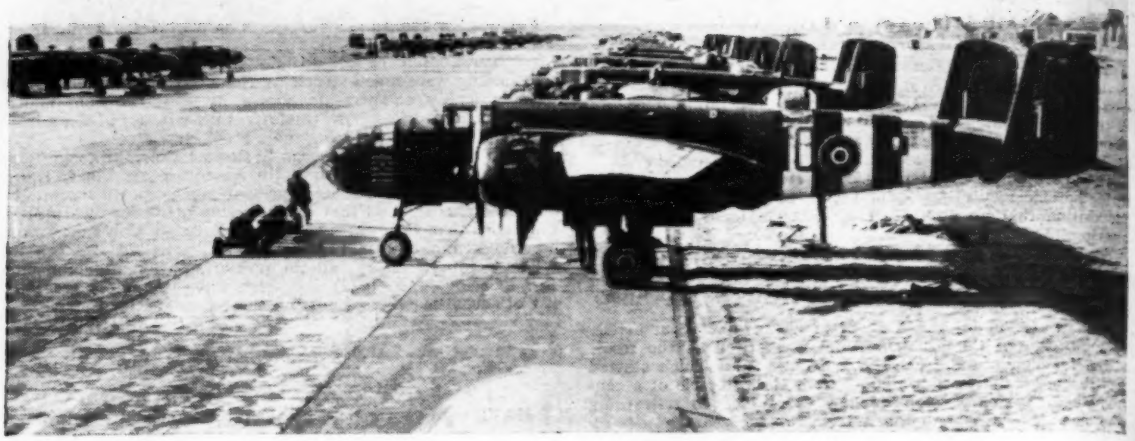
Efficiency of propulsion $= \frac{1}{1 + \left(\frac{v_2}{v_1}\right)^2}$, which is of the form

Efficiency of propulsion $= \frac{1}{1 + R^2}$, for the purposes of comparison with J. K. de Havilland's formula.

Whereas de Havilland's formula is of the First Degree my formula is of the Third Degree.

This formula, however, only gives the proportion of the *Residual Energy* that is converted into mechanical or kinetic energy of the motion of the rocket. A part of the calorific value, or the energy contained in the fuel, is used merely in heating up various gases from about atmospheric temperature to the temperature of combustion in the firing-chamber; and the residual energy, after heating up these gases, is then contained in the two portions of gases moving forwards and backwards respectively after the explosion. I have assumed that the gases moving forwards impart all, or practically all, their kinetic energy to the rocket before they leave it: this assumption, I believe, is justifiable.

R. E. C. I EKANAYAKA (Ceylon).



THE LONG SHADOWS OF WINTER: Mitchells of an R.A.F. medium bomber squadron lined up at the sides of a runway on the Continent.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Distinguished Service Order

Act. Sqn. Ldr. F. SMITH, D.F.C., R.A.A.F., No. 635 Sqn.—Sqn. Ldr. Smith has completed many more sorties since being awarded the D.F.C. Most of them have been against most heavily defended German targets. In September this officer was detailed to participate in an attack on a target near Calais. Whilst over the target his aircraft was repeatedly hit and sustained damage. He afterwards flew the badly damaged aircraft safely back to base. His determination and splendid fighting spirit have been a fine example to all.

Act. Wing Cdr. R. E. P. BROOKER, D.F.C., R.A.F.O.—This officer has displayed the highest standard of gallantry and determination in his attacks on the enemy. During a phase of intensive air operations over Northern France, prior to the landing of the invasion forces, Wing Cdr. Brooker led large formations of aircraft in attacks against a wide range of well-defended targets, including a number of radio stations. Much of the success achieved can be attributed to this officer's careful planning, inspiring leadership and skill in action. His record is most impressive.

Sqn. Ldr. H. C. TRAINOR, D.F.C., R.C.A.F., No. 401 (R.C.A.F.) Sqn.—Since being awarded a Bar to the D.F.C. this officer has led the squadron on many sorties during which considerable success has been achieved. Within a period of three weeks some 385 enemy vehicles have been put out of action, many of them by Sqn Ldr. Trainor. In addition 17 enemy aircraft were shot down, two of them by this gallant and relentless fighter. Throughout these operations Sqn. Ldr. Trainor displayed magnificent leadership, great determination and devotion to duty.

Wing Cdr. P. E. MEAGHER, D.F.C., R.A.F.O., No. 211 Sqn.—This officer has displayed the highest qualities of skill and courage in air operations and his record is outstanding. Since being awarded the D.F.C. he has participated in very many sorties, undertaken often in extremely bad weather and over difficult country. In these operations much damage has been inflicted on the enemy. By his inspiring leadership and unswerving devotion to duty, Wing Cdr. Meagher has contributed well to the successes obtained. In air fighting he has destroyed nine enemy aircraft.

Act. Wing Cdr. W. T. BROOKS, R.A.F.O., No. 635 Sqn.—In August, 1944, Wing Cdr. Brooks was detailed to attack, in daylight, an oil installation in Hamburg. In spite of fierce anti-aircraft defences, the attack was carried out with great accuracy. Wing Cdr. Brooks has raised the efficiency of the squadron to a very high standard. He has the complete confidence of his crews and the good results achieved by them have been due to his inspiring leadership.

Sqn. Ldr. R. K. HAYWARD, D.F.C., R.C.A.F., No. 411 (R.C.A.F.) Sqn.—Sqn. Ldr. Hayward is a very skilful and courageous fighter. During a period of intensive air operations since the landing in Northern France he has led his squadron on a very large number of sorties during which several hundred German mechanical vehicles have been most effectively attacked. In air fighting, Sqn. Ldr. Hayward has destroyed five enemy aircraft. His skilful leadership and iron determination have proved most inspiring.

Act. Wing Cdr. H. A. MORRISON, D.F.C., R.C.A.F., No. 405 Sqn.—In September, 1944, Wing Cdr. Morrison captained an aircraft detailed to attack Le Havre. Whilst over the target heavy and accurate anti-aircraft fire was encountered. Undeterred, this captain endeavoured to press home his attack. His aircraft was hit and sustained serious damage. The aircraft became almost uncontrollable. A fire started, and the fuselage became filled with smoke. The flames spread quickly, and it was evident that the aircraft could not be saved. Displaying great coolness, Wing Cdr. Morrison ordered his crew to leave by parachute. He, himself, would not leave until he was satisfied that all his comrades were clear. When he finally jumped the aircraft was down to a low altitude. This officer has invariably displayed the highest standard of courage and devotion to duty. He has completed very many sorties and, in his determination to complete his missions successfully, has often remained over the target for long periods.

Bar to Distinguished Flying Cross

Act. Flt. Lt. B. C. SANDALL, D.F.C., R.A.F.V.R.—This officer has participated in many sorties since being awarded the D.F.C. He has displayed the highest qualities of skill and courage, and his example has been most inspiring.

F/O. T. R. DAVIES, D.F.C., R.A.F.V.R., No. 647 Sqn.—F/O. Davies is now on his third tour, after completing two successful and eventful tours during which many vital targets were attacked. This officer has throughout his splendid operational career set a standard of efficiency, indomitable courage and devotion to duty which has set a brilliant example to all his squadron.

F/O A. W. MOORE, D.F.C., R.A.F.V.R., No. 12 Sqn.—Since the award of the D.F.C., this officer has displayed continued gallantry during a large number of operational missions. His fine qualities as captain of aircraft have not only welded his crew into a most efficient fighting unit, but have contributed very largely to the successes won by his squadron. He has operated against many of the major targets in Germany.

W/O. R. G. GOODWIN, D.F.C., R.A.F., No. 83 Sqn.—Since his previous award this officer has participated in numerous attacks against enemy targets. As flight engineer, W/O Goodwin has proved himself a skilful and efficient officer, cool and courageous under enemy fire and has set a splendid example by his airmanship which merits high praise.

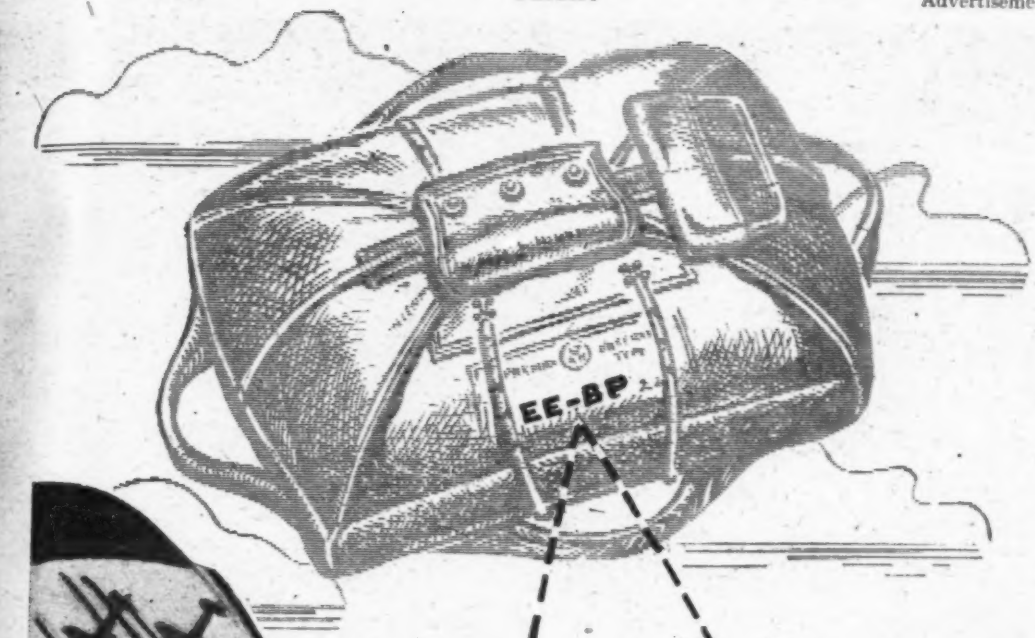
Act. Sqn. Ldr. A. S. GRANT, D.S.O., D.F.C., R.A.A.F., No. 139 Sqn.—Sqn. Ldr. Grant is an outstanding officer who has consistently obtained fine results from his missions. In March, 1944, he was navigator of an aircraft detailed to attack Berlin. While on the bombing run the aircraft was illuminated by searchlights and subjected to severe anti-aircraft fire. Much damage was sustained and one engine put out of action. Undeterred, Sqn. Ldr. Grant completed his bombing run and, subsequently, navigated the aircraft back to this country without navigational aids. The outstanding courage and devotion to duty of this officer has at all times set a fine example to all in his squadron.

Flt. Lt. J. L. V. COMANS, D.F.C., R.A.A.F., No. 97 Sqn.—Flt. Lt. Comans is an outstanding captain of aircraft whose excellent leadership and skill as a pilot have been largely responsible for many successes gained by his crew. Since the award of the D.F.C. he has completed a number of sorties, continuing to display coolness and courage in times of stress.

Act. Sqn. Ldr. E. J. SAUNDERS, D.F.C., R.A.F.V.R., No. 692 Sqn.—Since the award of the D.F.C. Sqn. Ldr. Saunders has completed a large number of sorties. He has a fine operational record of attacks on major heavily defended targets. The success of these operations has been largely due to the high degree of skill and navigational ability of this officer, together with his determination to locate and bomb accurately all his targets. As Squadron Navigation Officer, he has set a splendid example in the air and on the ground, which has been a source of inspiration to all crews.

Act. Sqn. Ldr. E. G. STOKES, D.F.C., R.A.F.V.R., No. 139 Sqn.—Act. Sqn Ldr Stokes has completed a large number of operational flights over heavily defended areas. He is an exceptional navigator who, by his careful preparation on the ground, and his reliability in the air, has largely contributed to the many successes achieved by his crew.

Act. Flt. Lt. W. J. LOVE, D.F.C., R.A.A.F., No. 582 Sqn.—Flt. Lt. Love has an exceptionally fine record of successful missions against numerous vital targets. At all times he has displayed the



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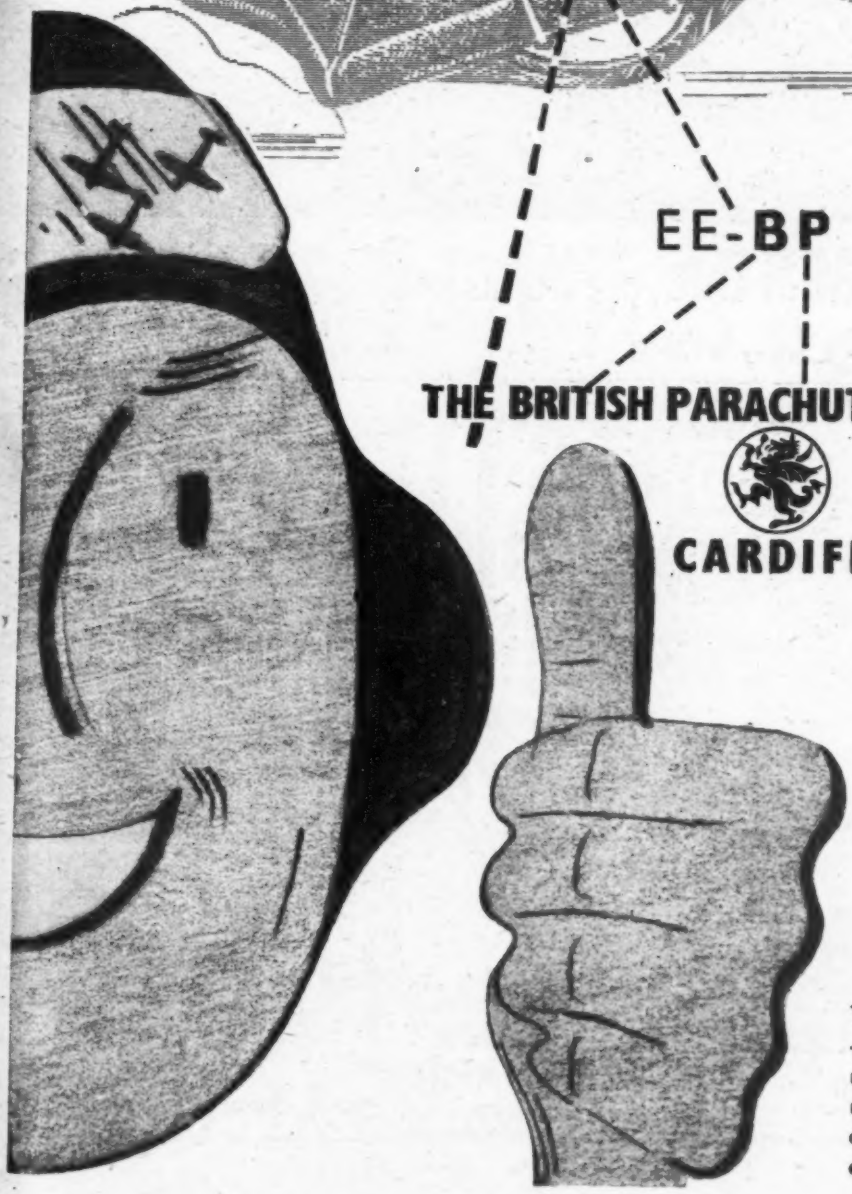

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SERVICE AVIATION

utmost keenness to engage the enemy. His fine fighting spirit, fearless courage and skill have set an excellent example to all aircrew personnel in his squadron.

Act. Flt. Lt. F. A. PHILLIPS, D.F.C., R.A.A.F., No. 7 Sqn.—Flt. Lt. Phillips has a splendid record of operations. At all times he has set a fine example of leadership, coolness and unfailing devotion to duty which has been the source of inspiration to his squadron. He has consistently displayed a fine fighting spirit and cheerful determination in the face of the most adverse circumstances.

Act. Flt. Lt. V. E. R. PIPER, D.F.C., R.A.A.F., No. 105 Sqn.—This officer has participated in numerous operational missions, including many attacks against major targets in the Ruhr. Since the award of the D.F.C., he has continued to display outstanding courage, determination and great skill as a navigator. His record on operations has been most commendable.

Flt. Lt. T. O. BRECKON, D.F.C., R.N.Z.A.F., No. 109 Sqn.—Flt. Lt. Breckon is a most keen and enthusiastic pilot. Since the award of the D.F.C., he has completed a large number of sorties on Mosquito aircraft. At all times he has continued to operate with outstanding ability, and his courage and determination merit high praise.

Act. Sqn. Ldr. B. A. BURBRIDGE, D.F.C., R.A.F.V.R., No. 85 Sqn. Flt. Lt. F. S. SKELTON, D.F.C., R.A.F.V.R., No. 85 Sqn.—As pilot and observer respectively these officers have completed many sorties and have destroyed seven enemy aircraft. They have displayed outstanding keenness, great skill and gallantry, setting an example worthy of the highest praise.

Flt. Lt. L. BRANDON, D.F.C., R.A.F.V.R., No. 107 Sqn.—This officer has set a fine example of gallantry and devotion to duty. He is a highly skilled and resolute member of aircraft crew and has assisted in the destruction of six enemy aircraft and six flying bombs.

Flt. Lt. A. E. WALKER, D.F.C., R.A.F.V.R., No. 6 Sqn.—Since the award of the D.F.C., Flt. Lt. Walker has continued to display outstanding courage and determination in attacks against enemy shipping. In July, 1944, he led a formation of aircraft in an attack on a large enemy ship, which was completely destroyed. In addition, he has sought out and destroyed many small enemy ships along the Dalmatian coast, pressing home his attacks with great skill. On many occasions, his aircraft has sustained damage from anti-aircraft fire, and in July, 1944, was forced to come down on the sea off the enemy coast. In August, 1944, while on a night sortie, he sighted two enemy schooners, which he attacked. On this occasion also his aircraft was badly damaged and he was compelled to abandon it by parachute. He remained for over 12 hours in his dinghy in a very rough sea, eventually reaching an uninhabited rock, from which he was rescued after five days. Despite such experiences, Flt. Lt. Walker has constantly shown outstanding skill and devotion to duty.

Act. Sqn. Ldr. G. W. SMALL, D.F.C., R.A.A.F., No. 451 Sqn.—Sqn. Ldr. Small has led his squadron on many missions over Italy and Southern France. He has always shown outstanding courage and determination in pressing home his attacks on the enemy, and has personally destroyed a large number of enemy vehicles. Under his leadership, his squadron has met with conspicuous success. Sqn. Ldr. Small has destroyed at least three enemy aircraft in combat.

Maj. DAWSON-SQUIBB, D.F.C., S.A.A.F., No. 2 (S.A.A.F.) Sqn.—Since taking over command of his squadron, this officer has led every mission with exceptional skill and steadfast courage in the face of enemy opposition, with the result that many motor transport vehicles, locomotives, railway lines and enemy guns have been destroyed. In air combat, Maj. Dawson-Squibb has destroyed two enemy aircraft and damaged others. His gallantry and devotion to duty have been highly commendable.

Maj. J. T. SECCOMBE, D.F.C., S.A.A.F., No. 1 (S.A.A.F.) Sqn.—Whilst commanding his squadron, Maj. Seccombe has displayed consistent determination and resolution, which have ensured the success of every mission he has undertaken. He has not only destroyed a large number of vehicles but has secured hits on selected targets on twelve occasions. This officer has destroyed three enemy aircraft and damaged others. His brilliant leadership and coolness in action have been an inspiration to all his pilots.

Capt. R. R. FARRANT, D.F.C., S.A.A.F., No. 21 (S.A.A.F.) Sqn.—This officer's courage and cool determination under harassing circumstances have always been outstanding. In June, 1944, he was observer in an aircraft which took part in an attack on Fossato railway bridge. On the second run over the target, two of his bombs exploded in mid air, causing severe damage to the aircraft. In spite of a fire in his cockpit, which he extinguished, and strong petrol fumes, Capt. Farrant navigated his aircraft successfully to base.

Lt. Col. B. R. MCKENZIE, D.S.O., S.A.A.F., No. 17 (S.A.A.F.) Sqn.—Now on his second tour of operational duty, this officer has completed a large number of operational sorties. He is an excellent squadron commander, and always flies on any difficult or hazardous mission himself. Under his inspiring and skilful leadership, excellent results have been obtained, and the high standard of morale existing in the squadron is largely due to his efforts. In August, 1944, Lt. Col. McKenzie was detailed to drop leaflets over France. On the return flight appalling weather

ANGLE OF CLIMB: A jeep performs the first part of an air journey by Dakota in India.

was encountered. His aircraft was tossed about from 6,000 to 18,000 feet, a wing tip was bent up and the fuselage tank split. By fine airmanship, he brought the damaged aircraft safely back to the vicinity of an airfield near the coast, where the hydraulic system failed, and he was forced down on to the sea. This harassing experience has in no way diminished Lt. Col. McKenzie's enthusiasm for operational flying.

Act. Sqn. Ldr. J. F. EDWARDS, D.F.C., D.F.M., R.C.A.F., No. 274 Sqn.—This officer has successfully completed a very large number of operational flights and has destroyed 13 enemy aircraft. He is a keen and courageous pilot, whose example and leadership have been most inspiring.

Flt. Lt. R. A. MILLER, D.F.C., R.A.F.V.R., No. 604 Sqn.—These officers have completed very many sorties in the role of pilot and observer respectively. They have displayed a high degree of skill and resolution, and have destroyed three enemy aircraft at night. P/O. Catchpole has also assisted in the destruction of another enemy aircraft.

Distinguished Flying Cross

Wing Cdr. E. J. MORRIS, D.S.O., R.A.F.
Sqn. Ldr. J. E. BAZALGETTE, R.A.F.V.R., No. 272 Sqn.
Sqn. Ldr. J. P. G. HARRIS, R.A.F., No. 223 Sqn.
Sqn. Ldr. R. G. HONEYMAN, A.F.C., R.A.F., No. 31 Sqn.
Sqn. Ldr. J. H. V. MILLINGTON, R.A.F., No. 117 Sqn.
Flt. Lt. A. R. BOYLE, R.A.F.V.R., No. 154 Sqn.
Flt. Lt. C. F. BRADLEY, R.A.F.V.R., No. 208 Sqn.
Flt. Lt. F. H. FODEN, R.A.F., No. 272 Sqn. (since reported missing).
Flt. Lt. J. R. A. HUXSTEP, R.A.F.V.R., No. 624 Sqn.
Flt. Lt. H. M. MORTON, R.A.F.V.R., No. 142 Sqn.
Flt. Lt. D. M. MOUBRAY, R.A.F.V.R., No. 237 Sqn.
Flt. Lt. C. D. A. SMITH, R.A.F.V.R., No. 213 Sqn.
Flt. Lt. D. M. ALSMYTHE, R.A.F.V.R., No. 223 Sqn.
Flt. Lt. D. A. THOMPSON, R.A.F.V.R., No. 600 Sqn.
Flt. Lt. C. S. VOS, R.A.F., No. 213 Sqn.
Flt. Lt. D. Q. WATSON, R.A.F.V.R., No. 614 Sqn.
Flt. Lt. P. J. WHITFIELD, R.A.F., No. 235 Sqn.
Flt. Lt. H. McP. DODD, R.A.F.V.R., No. 148 Sqn.
Flt. Lt. W. S. NORTHCOTE, R.A.F.V.R., No. 19 (S.A.A.F.) Sqn.
F/O A. P. BUXTON, R.A.F.V.R., No. 225 Sqn.
F/O. H. CHAPMAN, R.A.F.V.R., No. 223 Sqn.
F/O. A. C. CHRISTIE, R.A.F.V.R., No. 6 Sqn.
F/O. P. DORAN, R.A.F.V.R., No. 223 Sqn.
P/O. C. O. ELLISON, R.A.F., No. 70 Sqn.
F/O. R. H. GARWOOD, R.A.F.V.R., No. 213 Sqn.
F/O. A. D. JONES, R.A.F.V.R., No. 6 Sqn.
F/O. W. H. N. SLOAN, R.A.F.V.R., No. 208 Sqn.
F/O. G. H. SNAPE, R.A.F., No. 19 (S.A.A.F.) Sqn.
P/O. C. O. WISE, R.A.F.V.R.
P/O. R. D. FRANCIS, R.A.F.V.R., No. 614 Sqn.
P/O. V. J. G. LEWIS, R.A.F.V.R., No. 223 Sqn.
P/O. B. V. ROBB, R.A.F.V.R., No. 614 Sqn.
W/O. E. H. EVANS, R.A.F.V.R., No. 55 Sqn.
W/O. J. L. PAULDEN, R.A.F.V.R., No. 624 Sqn.
Wing Cdr. W. J. MCLEAN, A.F.C., R.A.A.F., No. 117 Sqn.
Sqn. Ldr. G. J. J. D. GLEESON, R.A.A.F., No. 450 Sqn.
Sqn. Ldr. D. H. MCBURNIE, D.F.M., R.A.A.F., No. 238 Sqn.
Flt. Lt. G. D. CANNON, R.A.A.F., No. 13 Sqn.
Flt. Lt. A. M. SWEETMAN, R.A.A.F.
Flt. Lt. H. J. BRAY, R.A.A.F., No. 451 (R.A.A.F.) Sqn.
Flt. Lt. E. C. HOUSE, D.F.M., R.A.A.F., No. 238 Sqn.
P/O. P. CATCHPOLE, R.A.F.V.R., No. 604 Sqn. (For citation see Flt. Lt. Miller, D.F.C., above.)
F/O. G. L. ARNOLD, R.A.A.F., No. 150 Sqn.
F/O. C. A. FALKLAND, R.A.A.F., No. 272 Sqn.
F/O. J. N. HANNAN, R.A.A.F., No. 238 Sqn.
F/O. G. C. W. O'NEIL, M.M., R.A.A.F., No. 451 (R.A.A.F.) Sqn.
P/O. J. F. CROMBIE, R.A.A.F., No. 150 Sqn.
P/O. W. C. MORTON, R.A.A.F., No. 142 Sqn.
P/O. P. D. NEILL, R.A.A.F., No. 70 Sqn.
P/O. E. C. PATON, R.A.A.F., No. 70 Sqn.
W/O. (now P/O.) P. J. DAVOREN, R.A.A.F., No. 243 Sqn.
F/O. S. E. MCFALL, R.C.A.F., No. 614 Sqn.
F/O. A. R. VANCE, R.C.A.F., No. 19 (S.A.A.F.) Sqn.
P/O. J. MOORE, R.C.A.F., No. 114 Sqn.
Flt. Lt. J. R. NATHSMITH, R.N.Z.A.F., No. 117 Sqn.
Flt. Lt. E. W. GARNETT, R.N.Z.A.F., No. 624 Sqn.
P/O. E. J. WALKER, R.N.Z.A.F., No. 150 Sqn.
Major P. de WET, S.A.A.F., No. 21 (S.A.A.F.) Sqn.
Capt. D. M. BREBNER, S.A.A.F., No. 1 (S.A.A.F.) Sqn.
Capt. G. R. CONNELL, S.A.A.F., No. 7 Sqn.
Capt. A. FORREST, S.A.A.F., No. 12 (S.A.A.F.) Sqn.
Capt. C. WALTER-POHL, S.A.A.F., No. 21 (S.A.A.F.) Sqn.
Lt. D. L. CLUR, S.A.A.F., No. 17 (S.A.A.F.) Sqn.
Lt. H. P. FREEMAN, S.A.A.F., No. 1 (S.A.A.F.) Sqn.
Major W. G. ANDREW, S.A.A.F., No. 225 Sqn.
Major O. P. GRAY, S.A.A.F., No. 17 (S.A.A.F.) Sqn.
Lt. R. C. THEUNISSEN, S.A.A.F., No. 40 (S.A.A.F.) Sqn.
Lt. C. H. VAN DER WESTHUIZEN, S.A.A.F., No. 21 (S.A.A.F.) Sqn.
Wing Cdr. D. O. BUTLER, R.C.A.F.O.
W/O. C. MACNAUGHTON, R.A.F.
W/O. J. S. BATES, R.A.A.F., No. 252 Sqn.
W/O. M. L. CECIL, R.A.A.F., No. 3 Sqn.
F/O. D. M. REID, R.C.A.F., No. 252 Sqn.
F/O. W. I. WARMINGTON, R.A.F.V.R., No. 166 Sqn.
F/O. K. ALDERSON, R.A.F.V.R., No. 51 Sqn.
F/O. P. C. BROWNE, R.A.F.V.R., No. 106 Sqn.
F/O. A. DUCKWORTH, R.A.F.V.R., No. 51 Sqn.
F/O. P. A. FYSON, R.A.F.V.R., No. 106 Sqn.
F/O. A. D. MACKENZIE, R.A.F.V.R., No. 75 (N.Z.) Sqn.
F/O. R. A. SUTTON, R.A.F.V.R., No. 10 Sqn.
F/O. W. M. WATKINS, R.A.F.V.R., No. 514 Sqn.
P/O. R. E. BAIN, R.A.F.V.R., No. 10 Sqn.
P/O. J. H. CARTER, R.A.F.V.R., No. 141 Sqn.
P/O. P. A. E. COLES, R.A.F.V.R., No. 141 Sqn.
P/O. W. R. DORAN, R.A.F.V.R., No. 97 Sqn.
P/O. J. ELLIS, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.
P/O. S. ESSAM, R.A.F.V.R., No. 51 Sqn.
P/O. D. H. K. ETRE, R.A.F., No. 50 Sqn.
P/O. E. L. HAYES, R.A.F.V.R., No. 10 Sqn.
P/O. H. C. HARRIS, R.A.F.V.R., No. 625 Sqn.
P/O. J. D. HEDDON, R.A.F.V.R., No. 51 Sqn.
P/O. C. W. HOWE, R.A.F.V.R., No. 97 Sqn.
P/O. W. J. HUME, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.
P/O. R. A. LAWSON, R.A.F.V.R., No. 10 Sqn.
P/O. J. F. MILLS, R.A.F.V.R., No. 61 Sqn.
P/O. H. O'NEILL, R.A.F.V.R., No. 51 Sqn.
P/O. P. TEMPLE, D.F.M., R.A.F.V.R., No. 7 Sqn.
P/O. H. TRUMAN, R.A.F.V.R., No. 625 Sqn.
P/O. E. J. WATSON, R.A.F.V.R., No. 97 Sqn.
W/O. L. DYRE-MATTHEWS, R.A.F.V.R., No. 12 Sqn.
W/O. A. C. MATHEWS, R.A.F.V.R., No. 83 Sqn.
W/O. J. SKINNER, R.A.F.V.R., No. 51 Sqn.
P/O. A. P. BOULTBEE, R.A.A.F., No. 97 Sqn.
P/O. J. D. MURTHA, R.A.A.F., No. 10 Sqn.

SERVICE AVIATION

P/O. J. E. NICHOLSON, R.A.A.F., No. 640 Sqn.
P/O. J. W. WAUGH, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
W/O. (now P/O.) J. B. BROWN, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
W/O. E. H. HANSEN, R.A.A.F., No. 97 Sqn.
F/O. W. S. PATTERSON, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
F/O. V. W. POUSHINSKY, R.C.A.F., No. 626 Sqn.
F/O. K. L. SCHMITZ, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O. J. K. SHEDDEN, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
F/O. W. R. SHELLINGTON, D.F.M., R.C.A.F. No. 429 (R.C.A.F.) Sqn.
P/O. J. M. BURNS, R.C.A.F., No. 51 Sqn.
F/O. J. J. P. CAMIRE, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
P/O. D. D. DAKIN, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
P/O. R. A. FORORAVE, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
P/O. R. J. MEEK, C.G.M., R.C.A.F., No. 626 Sqn.
P/O. J. G. RITCH, R.C.A.F., No. 625 Sqn.
P/O. G. A. SANGSTER, R.C.A.F., No. 9 Sqn.
P/O. A. SLYWCHUK, R.C.A.F., No. 50 Sqn.
P/O. J. G. WARD, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
W/O. (now P/O.) J. J. H. MAXWELL, R.C.A.F., No. 97 Sqn.
F/O. J. D. MOUAT, R.N.Z.A.F., No. 50 Sqn.
F/O. A. R. KITTO, R.N.Z.A.F., No. 106 Sqn.
P/O. J. H. F. WHYTE, R.N.Z.A.F., No. 50 Sqn.
Son Ldr. B. J. MACDERMOTT, R.A.A.F., No. 462 (R.A.A.F.) Sqn.
Flt. Lt. N. O. S. BAYLEY, R.A.F.V.R., No. 158 Sqn.
Flt. Lt. H. J. GOODWIN, D.F.M., R.A.F.V.R., No. 425 (R.C.A.F.) Sqn.
Flt. Lt. R. A. SLATER, R.A.F.V.R., No. 640 Sqn.
Sqn Ldr. W. C. MCGUFFIN, R.C.A.F., No. 419 Sqn.
Flt. Lt. H. P. WOODRUFF, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Flt. Lt. H. R. CHEKALUCK, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
Flt. Lt. J. M. R. LANGLOIS, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
Flt. Lt. G. W. PATTEN, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Flt. Lt. T. F. RANCE, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. E. M. ALDRED, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
F/O. J. H. CALDER, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. J. R. CALDERBANK, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
F/O. J. G. J. DARGIS, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. A. L. DELANEY, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. S. J. DE ZORZI, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
F/O. J. C. HENRY, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. K. R. KIDD, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
F/O. J. C. LAKEMAN, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
F/O. G. LINEKER, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
F/O. J. L. MCDONELL, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
P/O. L. A. J. GAUDRY, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
P/O. W. K. HAMMOND, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
P/O. P. E. REGIMBAL, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Wing Cdr. C. W. M. LING, R.A.F., No. 51 Sqn.
Wing Cdr. R. K. CASSELS, A.F.C., R.A.F.O., No. 76 Sqn.
Flt. Lt. J. P. HOWARD, R.C.A.F., No. 139 Sqn.
Flt. Lt. R. W. READ, R.A.F.V.R., No. 138 Sqn.
Flt. Lt. S. H. JOHNSON, R.A.A.F., No. 582 Sqn.
F/O. R. H. ANDERSON, R.A.F.V.R., No. 640 Sqn.
F/O. C. K. CURTIS, R.A.F., No. 138 Sqn.
F/O. W. J. MULLEN, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. G. O. RUSSELL, R.A.F.V.R., No. 115 Sqn.
F/O. N. D. WILKINSON, R.A.F.V.R., No. 608 Sqn.
F/O. V. T. WOODS, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. K. J. SHEPPARDSON, R.A.F.V.R., No. 640 Sqn.
F/O. T. W. CASSOR, R.C.A.F., No. 158 Sqn.
F/O. J. D. KOCH, R.C.A.F., No. 158 Sqn.
F/O. D. A. LAMPARD, R.A.F.V.R., No. 272 Sqn.
F/O. G. H. MONTGOMERY, R.C.A.F., No. 158 Sqn.
F/O. E. G. MYRING, R.A.F.V.R., No. 272 Sqn.
F/O. C. F. RIDEOUT, R.C.A.F., No. 272 Sqn.
F/O. J. T. RODGERS, R.A.A.F., No. 462 (R.A.A.F.) Sqn.
F/O. C. ROWSELL, R.A.F.V.R., No. 415 (R.C.A.F.) Sqn.
F/O. H. V. TAYLOR, R.A.F.V.R., No. 158 Sqn.
F/O. D. J. BATHFIELD, R.A.F.V.R., No. 158 Sqn.
F/O. K. V. BROWNE, R.A.A.F., No. 158 Sqn.
F/O. A. W. MEADEN, R.A.F.V.R., No. 158 Sqn.
F/O. E. PAULSEN, R.A.A.F., No. 158 Sqn.
F/O. L. SMITH, R.A.F.V.R., No. 90 Sqn.
Flt. Lt. M. D. GRIBBIN, D.F.M., R.A.F.V.R., No. 627 Sqn.
Flt. Lt. D. J. RABY, R.A.F.V.R., No. 550 Sqn.
Flt. Lt. J. L. SHARP, A.F.C., R.A.F., No. 214 Sqn.
Flt. Lt. F. P. L. BROOME, R.A.F.V.R., No. 97 Sqn.
Flt. Lt. E. F. BURGESS, R.A.F.V.R., No. 10 Sqn.
Flt. Lt. L. J. HAMPTON, D.F.M., R.A.F.V.R., No. 10 Sqn.
Flt. Lt. I. C. S. HAY, R.A.F.V.R., No. 514 Sqn.
Flt. Lt. J. H. HUDSON, D.F.M., R.A.F.V.R., No. 156 Sqn.
Flt. Lt. E. M. HUNTER, D.F.M., R.A.F.V.R., No. 109 Sqn.
Flt. Lt. G. A. KIDD, R.A.F.V.R., No. 138 Sqn.
Flt. Lt. E. MOORE, D.F.M., R.A.F.V.R., No. 105 Sqn.
Flt. Lt. G. ROBINSON, D.F.M., R.A.F., No. 83 Sqn.
Flt. Lt. D. W. WOOLLEY, D.F.M., R.A.F.V.R., No. 83 Sqn.
F/O. M. E. ANDERTON, R.A.F.V.R., No. 9 Sqn.
F/O. T. F. BOLTER, R.A.F.V.R., No. 77 Sqn.
F/O. W. BRAMWELL, D.F.M., R.A.F.V.R., No. 156 Sqn.
F/O. L. G. BURDEN, R.A.F.V.R., No. 467 (R.A.A.F.) Sqn.
F/O. C. W. CHALMERS, D.F.M., R.A.F., No. 101 Sqn.
F/O. R. W. CHAPPELL, R.A.F.V.R., No. 149 Sqn.
F/O. J. F. CLARK, R.A.F.V.R., No. 166 Sqn.
F/O. H. C. CLARK, R.A.F.V.R., No. 9 Sqn.
F/O. W. C. FITCH, R.A.F.V.R., No. 83 Sqn.
F/O. H. T. FORREST, R.A.F.V.R., No. 9 Sqn.
F/O. D. MCG. GRANT, R.A.F.V.R., No. 207 Sqn.

FLYING ANGEL: L.A/CW. L. Brailsford, who has made 40 trips to the Continent as a medical orderly tending wounded men being brought back by air.

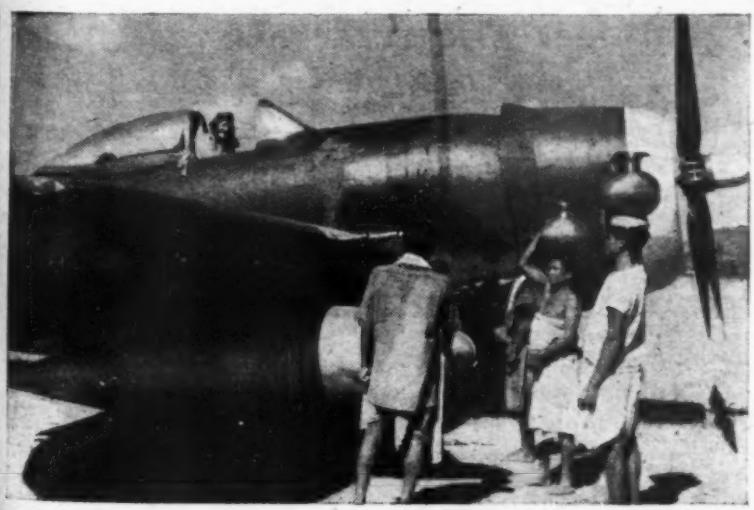
F/O. E. GREENHALGH, R.A.F., No. 192 Sqn.
F/O. J. S. GRIFFITHS, R.A.F.V.R., No. 576 Sqn.
F/O. F. G. KELSEY, R.A.F.V.R., No. 625 Sqn.
F/O. W. D. KNOWLES, R.A.F.V.R., No. 97 Sqn.
F/O. D. A. MACARTHUR, R.A.F.V.R., No. 166 Sqn.
F/O. H. O. MCNEICE, R.A.F.V.R., No. 10 Sqn.
F/O. C. MARTIN, R.A.F.V.R., No. 166 Sqn.
F/O. L. MARTIN, D.F.M., R.A.F.V.R., No. 10 Sqn.
F/O. F. V. NANCARROW, R.A.F.V.R., No. 625 Sqn.
F/O. D. A. PARKER, R.A.F.V.R., No. 78 Sqn.
F/O. E. G. PARSONS, R.A.F., No. 467 (R.A.A.F.) Sqn.
F/O. W. A. REFFIN, R.A.F.V.R., No. 57 Sqn.
F/O. S. RICHARDSON, D.F.M., R.A.F.V.R., No. 692 Sqn.
F/O. J. G. THOMPSON, R.A.F.V.R., No. 106 Sqn.
F/O. J. B. THOMSON, R.A.F.V.R., No. 138 Sqn.
F/O. A. G. WALLIS, R.A.F.V.R., No. 10 Sqn.
Sqn. Ldr. F. HURLEY, R.C.A.F., No. 78 Sqn.
Flt. Lt. J. M. BURK, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
Flt. Lt. T. CAMPBELL, R.C.A.F., No. 97 Sqn.
Flt. Lt. A. M. COLEMAN, R.A.A.F., No. 149 Sqn.
Flt. Lt. L. H. LAWTON, D.F.M., R.A.A.F., No. 156 Sqn.
F/O. D. A. JENNINGS, R.A.A.F., No. 83 Sqn.
F/O. N. W. SANDERS, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
Flt. Lt. B. A. BUCKHAM, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
F/O. R. TARDENT, R.A.A.F., No. 460 Sqn.
F/O. A. B. L. TOTTENHAM, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
Sqn. Ldr. W. D. MARTIN, R.A.F.V.R., No. 115 Sqn.
Flt. Lt. A. H. BIRD, D.F.M., R.A.F., No. 101 Sqn.
Flt. Lt. C. W. COWAN, D.F.M., R.A.F.
Flt. Lt. K. DEAR, R.A.F.V.R., No. 239 Sqn.
Flt. Lt. A. C. H. DENNIS, D.F.M., R.A.F.V.R., No. 692 Sqn.
Flt. Lt. J. H. GILLMORE, D.F.M., R.C.A.F., No. 635 Sqn.
Flt. Lt. J. T. HEWITT, R.C.A.F., No. 1[illegible] Sqn.
Flt. Lt. A. K. IRWIN, R.C.A.F., No. 83 Sqn.
Flt. Lt. E. J. TROTTER, D.F.M., R.C.A.F., No. 582 Sqn.
Flt. Lt. W. V. H. WEBSTER, R.C.A.F., No. 132 Sqn.
F/O. G. O. DOWNING, R.C.A.F., No. 149 Sqn.
F/O. C. W. FEY, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
F/O. H. GOODWIN, D.F.M., R.C.A.F., No. 692 Sqn.
F/O. A. A. HARRIS, R.C.A.F., No. 106 Sqn.
F/O. D. R. HUTCHEON, R.C.A.F., No. 434 Sqn.
F/O. J. R. JUTRAS, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. J. E. E. LEGAULT, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
Flt. Lt. A. R. GALBRAITH, R.N.Z.A.F., No. 83 Sqn.
Flt. Lt. E. C. W. ANDERSON, R.N.Z.A.F., No. 57 Sqn.
Flt. Lt. T. S. KNAPMAN, R.N.Z.A.F., No. 218 Sqn.
F/O. P. F. CARLISLE, R.A.F., No. 206 Sqn.
F/O. T. A. WICKHAM-JONES, R.A.F.V.R., No. 77 Sqn.
F/O. R. L. WILLIAMS, R.A.F.V.R., No. 35 Sqn.
F/O. C. R. WINTER, R.A.F.V.R., No. 199 Sqn.
F/O. R. H. WRIGHT, D.F.M., R.A.F.V.R., No. 635 Sqn.
F/O. C. E. YOUNG, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
F/O. H. ARCHER, R.A.F.V.R., No. 106 Sqn.
F/O. J. CASTAGNOLA, R.A.F.V.R., No. 57 Sqn.
F/O. R. A. E. DEAR, R.A.F.V.R., No. 61 Sqn.
F/O. W. LONGMORE, R.A.F.V.R., No. 51 Sqn.
F/O. H. TAYLOR, R.A.F.V.R., No. 115 Sqn.
F/O. V. B. TEMPLE, R.A.F.V.R., No. 156 Sqn.
F/O. J. THORNTON, R.A.F., No. 115 Sqn.
F/O. J. S. WEATERTON, R.A.F.V.R., No. 640 Sqn.
P/O. S. D. ANDREWS, R.A.F.V.R., No. 578 Sqn.
P/O. A. BARNES, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
P/O. J. T. H. BEECH, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
P/O. R. A. BEVANS, R.A.F.V.R., No. 7 Sqn.
P/O. I. H. BLACK, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
P/O. R. C. BOND, R.A.F.V.R., No. 626 Sqn.
P/O. D. BRYSON, R.A.F.V.R., No. 51 Sqn.
P/O. D. CADMAN, R.A.F.V.R., No. 78 Sqn.
P/O. C. CAMPBELL, R.A.F.V.R., No. 115 Sqn. (since deceased).
P/O. P. CAMPBELL, R.A.F., No. 76 Sqn.
P/O. D. CHAMBERLAIN, R.A.F.V.R., No. 51 Sqn.
P/O. G. F. CLARKE, R.A.F.V.R., No. 100 Sqn.
P/O. J. A. C. CLARKE, R.A.F.V.R., No. 35 Sqn.
P/O. I. C. CRAIB, R.A.F.V.R., No. 51 Sqn.
P/O. J. E. DICKINSON, R.A.F.V.R., No. 102 Sqn.
P/O. J. R. DIXON, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
P/O. G. J. EDWARDS, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
P/O. P. EDWARDS, R.A.F.V.R., No. 578 Sqn.
P/O. E. KNOX FARFAN, R.A.F.V.R., No. 12 Sqn.
P/O. C. FENWICK, R.A.F., No. 622 Sqn.
P/O. J. FIRTH, R.A.F.V.R., No. 78 Sqn.
P/O. H. T. FLINDELL, R.A.F.V.R., No. 578 Sqn.
P/O. W. FREEMAN, R.A.F.V.R., No. 626 Sqn.
P/O. R. H. FRY, R.A.F.V.R., No. 51 Sqn.
P/O. L. G. GILMORE, R.A.F.V.R., No. 7 Sqn.
P/O. L. H. GLADMAN, R.A.F.V.R., No. 100 Sqn.
P/O. H. GOODWIN, R.A.F.V.R., No. 467 (R.C.A.F.) Sqn.
P/O. W. W. GRANT, R.A.F.V.R., No. 51 Sqn.
P/O. P. E. HAMMOND, R.A.F.V.R., No. 578 Sqn.
W/O. G. H. BULLEY, R.C.A.F., No. 172 Sqn.
Flt. Lt. R. I. GILLIES, R.A.A.F., No. 622 Sqn.
W/O. J. E. FARQUHARSON, R.C.A.F., No. 632
P/O. A. J. TINDALL, R.A.F.V.R., No. 97 Sqn.
P/O. G. E. THOMAS, R.A.F.V.R., No. 550 Sqn.
P/O. W. TUNSTALL, R.A.F.V.R., No. 158 Sqn.
P/O. J. R. B. WILLIAMS, R.A.F.V.R., No. 76 Sqn.
P/O. A. C. WILSON, R.A.F.V.R., No. 76 Sqn.
P/O. W. M. WITHERELL, R.A.F.V.R., No. 51 Sqn.
P/O. V. W. YORK, R.A.F.V.R., No. 7 Sqn.
W/O. F. M. COE, R.A.F.V.R., No. 692 Sqn.
W/O. W. GILROY, R.A.F.V.R., No. 7 Sqn.
W/O. D. JACKSON, R.A.F.V.R., No. 156 Sqn.
W/O. J. S. HARRISON, R.A.F., No. 582 Sqn.
W/O. J. MCGUINNESS, R.A.F.V.R., No. 622 Sqn.
W/O. H. MCPHERSON, R.A.F.V.R., No. 90 Sqn.
W/O. G. E. PINFOLD, R.A.F.V.R., No. 166 Sqn.
W/O. R. F. POSSNETT, R.A.F.V.R., No. No. 90 Sqn.

SERVICE AVIATION

W/O. J. SABIN, R.A.F.V.R., No. 625 Sqn.
F/O. F. G. DAVEY, R.A.A.F., No. 44 Sqn.
F/O. R. W. HOFSTETTER, R.A.A.F., No 460 (R.A.A.F.) Sqn.
F/O. A. L. JOHNSON, R.A.A.F., No. 635 Sqn.
P/O. H. H. BEATTIE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. C. E. BINION, R.A.A.F., No. 44 Sqn.
P/O. G. B. DIGHT, R.A.A.F., No. 149 Sqn.
P/O. K. J. DOWSETT, R.A.A.F., No. 149 Sqn.
P/O. J. J. EGAN, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. B. A. J. HARGREAVES, R.A.F.V.R., No. 514 Sqn.
P/O. A. L. HAYNES, R.A.F.V.R., No. 423 (R.C.A.F.) Sqn.
P/O. G. K. HOLDEN, R.A.F.V.R., No. 51 Sqn.
P/O. N. D. HOLDSWORTH, R.A.F.V.R., No. 550 Sqn.
P/O. J. W. HOLT, R.A.F.V.R., No. 428 (R.C.A.F.) Sqn.
P/O. W. F. HOWARD, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
P/O. G. J. HUDSON, R.A.F.V.R., No. No. 156 Sqn.
P/O. W. W. A. JOY, R.A.F.V.R., No. 622 Sqn.
P/O. H. KENDALL, R.A.F.V.R., No. 578 Sqn.
P/O. L. KIER, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
P/O. R. S. KING, R.A.F.V.R., No. 427 (R.C.A.F.) Sqn.
P/O. J. LITTLEWOOD, R.A.F.V.R., No. 100 Sqn.
P/O. D. D. LINDSAY, R.A.F.V.R., No. 166 Sqn.
P/O. P. F. MCKINNEY, R.A.F.V.R., No. 640 Sqn.
P/O. R. W. B. MEDLEY, R.A.F.V.R., No. 625 Sqn.
P/O. F. W. MORGAN, R.A.F.V.R., No. 101 Sqn.
P/O. W. G. MORRISH, R.A.F.V.R., No. 51 Sqn.
P/O. R. W. PAPE, R.A.F.V.R., No. 10 Sqn.
P/O. R. B. PERKINS, R.A.F.V.R., No. 35 Sqn.
P/O. R. O. PICK, R.A.F.V.R., No. 514 Sqn.
P/O. K. MCL. RAMSDEN, R.A.F.V.R., No. 178 Sqn.
P/O. S. N. REDSHAW, R.A.F.V.R., No. 12 Sqn.
P/O. F. E. RUMSEY-WILLIAMS, R.A.F.V.R., No. 578 Sqn.
P/O. H. A. SATTERTHAITE, R.A.F.V.R., No. 35 Sqn.
P/O. G. A. SERRELS, R.A.F.V.R., No. 166 Sqn.
P/O. T. J. SHERBURN, R.A.F.V.R., No. 640 Sqn.
P/O. V. A. STAPLEY, R.A.F.V.R., No. 166 Sqn.
P/O. B. B. STRAW, R.A.F.V.R., No. 101 Sqn.
P/O. J. E. TAYLOR, R.A.F.V.R., No. 50 Sqn.
P/O. R. M. HILLIARD, R.A.A.F., No. 35 Sqn.
P/O. D. A. MCDONALD, R.A.A.F., No. 578 Sqn.
P/O. T. F. PERRIGNON, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. J. P. QUANE, R.A.A.F., No. 408 (R.A.A.F.) Sqn.
P/O. J. VENN, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. R. S. STOTT, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. J. A. WILSON, R.A.A.F., No. 635 Sqn.
W/O. C. R. ANDERSON, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
W/O. E. C. ORCHARD, R.A.A.F., No. 15 Sqn.
W/O. (now P/O.) W. O. PAICE, R.A.A.F., No. 635 Sqn.
W/O. V. C. REID, R.A.A.F., No. 15 Sqn.
W/O. (now P/O.) J. S. WILLIAMS, R.A.A.F., No. 635 Sqn.
F/O. J. K. PERRY, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. D. H. POPPLESTONE, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
F/O. T. H. PRINGLE, R.C.A.F., No. 578 Sqn.

Distinguished Flying Medal

Flt. Sgt. E. THORNTON, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. G. W. VINES, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. S. WALTON, R.A.F.V.R., No. 51 Sqn.
Flt Sgt. S. G. WATERS, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. J. WELLINGS, R.A.F.V.R., No. 15 Sqn.
Flt. Sgt. F. J. WHEELER, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. W. J. WHITBREAD, R.A.F.V.R., No. 635 Sqn.
Flt. Sgt. H. WHITTAKER, R.A.F.V.R., No. 635 Sqn.
Flt. Sgt. H. WILCOCK, R.A.F.V.R., No. 582 Sqn.
Flt. Sgt. F. WILLIE, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. C. L. S. WILLIAMS, R.A.F.V.R., No. 9 Sqn.
Flt. Sgt. W. APPLEBY, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. D. W. ASPINALL, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. (now P/O.) E. F. BAKER, R.A.F.V.R., No. 582 Sqn.
Flt. Sgt. F. G. BOOTHBY, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. J. R. BRISTOW, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
Flt. Sgt. P. R. BROWNLOW, R.A.F.V.R., No. 582 Sqn.
Flt. Sgt. (now P/O.) D. CARRUTHERS, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. J. CHRISTIAN, R.A.F.V.R., No. 49 Sqn.
Flt. Sgt. (now P/O.) J. S. CLARK, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. M. COCHRANE, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. W. DAVIES, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. A. J. DENNIS, R.A.F.V.R., No. 415 (R.C.A.F.) Sqn.
Flt. Sgt. O. B. M. DOWDALL, R.A.F., No. 576 Sqn.
Flt. Sgt. E. DRAKE, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. R. W. GARRARD, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. D. B. W. GILBERT, R.A.F.V.R., No. 166 Sqn.
Flt. Sgt. J. D. GRAY, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. E. J. GREEN, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. E. R. G. HAINES, R.A.F.V.R., No. 49 Sqn.
Flt. Sgt. P. J. HARDIMAN, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. (now P/O.) J. HARMER, R.A.F., No. 158 Sqn.
Flt. Sgt. W. HARRISON, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. A. K. HAYES, R.A.F.V.R., No. 78 Sqn.
Flt. Sgt. J. R. D. HENDERSON, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
Flt. Sgt. E. D. HUGHES, R.A.F.V.R., No. 35 Sqn.
Sgt. W. BARBER, R.A.F.V.R., No. 35 Sqn.
Sgt. R. MACD. CALDER, R.A.F.V.R., No. 76 Sqn.
Sgt. D. H. G. DARK, R.A.F.V.R., No. 76 Sqn.
Sgt. P. H. DAVIS, R.A.F.V.R., No. 76 Sqn.
Sgt. H. EVANS, R.A.F.V.R., No. 76 Sqn.
Sgt. A. HENWORTH, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. (now P/O. E. H. WILLIAMS, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. F. E. WILLIS, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. W. H. WYER, R.A.F.V.R., No. 158 Sqn.
Flt. Sgt. R. M. YOUNG, R.A.F.V.R., No. 578 Sqn.
Act. Flt. Sgt. N. M. COCKADAY, R.A.F.V.R., No. 582 Sqn.
Act. Flt. Sgt. M. SCHOLES, R.A.F.V.R., No. 35 Sqn.
Sgt. G. BAILEY, R.A.F.V.R., No. 578 Sqn.
Sgt. W. BARTON, R.A.F.V.R., No. 76 Sqn.
Sgt. (now P/O.) R. H. BROOKES, R.A.F.V.R., No. 76 Sqn.
Sgt. J. A. COWELL, R.A.F.V.R., No. 578 Sqn.
Sgt. A. DICKINSON, R.A.F.V.R., No. 578 Sqn.
Sgt. H. FENDER, R.A.F.V.R., No. 12 Sqn.
Sgt. G. FIRTH, R.A.F.V.R., No. 578 Sqn.
Sgt. R. A. GREISON, R.A.F., No. 51 Sqn.
Sgt. E. S. GROSVENOR, R.A.F.V.R., No. 622 Sqn.
Sgt. J. S. HOYLAND, R.A.F.V.R., No. 578 Sqn.
Sgt. D. A. JONES, R.A.F.V.R., No. 76 Sqn.
Sgt. A. MARRIOTT, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. D. J. MORLAND, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Sgt. L. A. MASON, R.A.F.V.R., No. 76 Sqn.
Sgt. C. H. MEARS, R.A.F.V.R., No. 578 Sqn.
Sgt. J. ORMEROD, R.A.F.V.R., No. 101 Sqn.
Sgt. K. R. REA, R.A.F.V.R., No. 632 Sqn.
Flt. Sgt. R. A. HOUNSOME, R.A.F.V.R., No. 514 Sqn.
Flt. Sgt. A. KIRKHAM, R.A.F.V.R., No. 75 (N.Z.) Sqn.
Flt. Sgt. F. B. KNOTT, R.A.F., No. 50 Sqn.
Flt. Sgt. S. R. LAMBERT, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. F. N. LARARD, R.A.F.V.R., No. 265 Sqn.
Flt. Sgt. S. OSBORNE, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. W. A. PETERKIN (now prisoner of war), R.A.F.V.R., No. 625 Sqn.
Flt. Sgt. C. BIRTWISTLE, R.A.F., No. 166 Sqn.
Flt. Sgt. K. COOPER, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. S. J. FLINT, R.A.F.V.R., No. 239 Sqn.
Flt. Sgt. K. FORREST, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. J. F. GAUWELOOSE, R.A.F.V.R., No. 57 Sqn.
Flt. Sgt. G. R. H. GILBERT, R.A.F.V.R., No. 61 Sqn.
Sgt. S. C. ALDRIDGE, R.A.F.V.R., No. 166 Sqn.
Sgt. J. D. BELL, R.A.F.V.R., No. 578 Sqn.
Sgt. D. BOOTHBY, R.A.F.V.R., No. 61 Sqn.
Sgt. P. DAWSON, R.A.F.V.R., No. 514 Sqn.
Sgt. A. W. DOWNS, R.A.F.V.R., No. 166 Sqn.
Sgt. B. FERRIES, R.A.F.V.R., No. 514 Sqn.
Flt. Sgt. R. TOWLES, R.A.F., No. 51 Sqn.
Flt. Sgt. H. WILSON, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. J. A. WOOLLARD, R.A.F.V.R., No. 166 Sqn.
Sgt. J. R. ABBOT, R.A.F.V.R., No. 138 Sqn.
Flt. Sgt. R. V. SMITH, R.A.F.V.R., No. 19 (S.A.A.F.) Sqn.
Sgt. J. W. GUNDRY, R.A.F.V.R., No. 624 Sqn.
Sgt. G. E. IVES, R.A.F.V.R., No. 150 Sqn.
Sgt. P. T. HADDEN, R.A.F.V.R., No. 61 Sqn.
Sgt. L. R. JONES, R.A.F.V.R., No. 51 Sqn.
Sgt. A. W. NEWTON, R.A.F.V.R., No. 51 Sqn.
Sgt. D. A. NICOLSON, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. E. R. BOLAND, R.C.A.F., No. 44 Sqn.
Sgt. R. JOHNSON, R.A.F.V.R., No. 578 Sqn.
Sgt. P. H. JOYCE, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. R. B. DOCKERAY, R.A.F.V.R., No. 515 Sqn.
Flt. Sgt. F. VERITY, R.A.F.V.R., No. 515 Sqn.
Flt. Sgt. A. V. PEARSON, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Sgt. R. V. FISHER, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. J. SCBIAK, R.C.A.F., No. 408 (R.C.A.F. Sqn.



ON THE BURMA FRONT: Flt. Sgt. F. W. Richard's Thunderbolt comes in for some admiration by the local Manipuri folk at a forward airstrip.

Army Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in Italy:—

Military Cross

Lt. F. T. ABBEY, Army Air Corps.

Military Medal

L./Cpl. M. W. MITCHELL, Army Air Corps.

THE KING has been graciously pleased to approve the following award in recognition of distinguished services:—

Distinguished Flying Cross

Capt. (temp. Maj.) J. B. MULLOCK, M.C., Royal Regiment of Artillery.

THE KING has been graciously pleased to approve the following awards:—

B.E.M. (Mil.)

Flt. Sgt. W. W. MCQUEEN, R.A.F. As acting master of a high-speed launch Flt. Sgt. McQueen was, one night in April, 1944, directed to proceed to the assistance of a Catalina aircraft which had come down on the sea. Extremely heavy weather prevailed at the time, but, after several unsuccessful attempts had been made, the aircraft was finally taken in tow by the launch and brought safely back to base without damage or casualties. During the fourteen hours at sea, in waters within easy reach of enemy aircraft, Flt. Sgt. McQueen remained on the bridge directing the operation. It was entirely due to his initiative and excellent seamanship that the aircraft and crew were successfully rescued. He has served as coxswain on many Air/Sea Rescue sorties during the past five years, but this was the first sortie in which he was in command of a high-speed launch.

Flt. Sgt. E. S. NEILL, R.C.A.F., No. 426 (R.C.A.F.) Sqn.—This airman was mid-upper gunner of a bomber which, when preparing to land on return from an operational mission, crashed. The aircraft was scattered over a considerable area and demolished a house which immediately caught fire. Flt. Sgt. Neill managed to extricate himself from the burning aircraft wreckage and, with great presence of mind, succeeded in dragging out four other members of the crew. Three of these were found later to be dead, but the pilot, who was dangerously injured, owes his life to Flt. Sgt. Neill's prompt and gallant action. Flt. Sgt. Neill also assisted in rescuing two women and two children who were trapped in the demolished and burning house. He displayed exceptional coolness and courage under very perilous circumstances.

Act. Flt. Sgt. G. F. WOTTON, R.A.F.V.R.—During live hand grenade practice at a range in April, 1944, Flt. Sgt. Wotton was instructing airmen in the final stages of a course. An airman made a false throw and the grenade after hitting the parapet fell back into the throwing pit. The pupil had jumped to the narrow passage leading from the pit and the grenade rolled between his legs. With great presence of mind Flt. Sgt. Wotton pulled the pupil to the ground behind some sandbags and picked up the grenade throw-

SERVICE AVIATION

ing it clear of the pit. It exploded after travelling five yards. By his prompt and courageous action Flt. Sgt. Wotton saved the life of the pupil. There was insufficient time for the pupil to be pulled round the traverse of the pit as this involved turning two corners.

Foreign Decorations

THE KING has granted unrestricted permission for the wearing of the following decoration conferred upon the personnel indicated in recognition of valuable services rendered in connection with the war :—

Conferred by the President of the Republic of Poland

Cross of Valour

F/O. R. A. HUCK, R.A.F.V.R.
P/O. F. D. HAWKINS, R.A.F.V.R.
P/O. N. J. SCOTT, R.A.F.V.R.
P/O. E. P. WARING, R.A.F.V.R.

Roll of Honour

Casualty Communiqué No. 455.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 69 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. L. W. Delaney; Sgt. H. Hindle; Flt. Sgt. J. Hough; Sgt. W. F. Johnson; Sgt. J. McL. Mackay; Flt. Sgt. E. Moody; F/O. G. C. Owens; Flt. Sgt. E. J. W. Reed; Sgt. G. A. Thomson; Sgt. A. W. Tucker; Sgt. E. Walsh.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. S. W. Irons; Sgt. H. Johnson; Sgt. C. Milburn; Sgt. H. S. Mitchell.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. C. Ablett; Flt. Sgt. S. A. Berry; P/O. J. Borland, D.F.C.; F/O. A. E. Busby; Sgt. K. R. Butcher; Flt. Sgt. S. P. Clark, D.F.M.; Flt. Lt. F. C. Clarke; Sgt. J. E. Clarke; Sgt. W. R. Collier; Flt. Sgt. D. L. Cooper; Sgt. F. A. Erwood; Sgt. W. Findley; Sgt. K. H. Harper; Sgt. J. F. Hoban; Flt. Sgt. R. W. Homewood; Sgt. D. Hudson; Flt. Sgt. J. S. Jarvis; Sgt. D. O. Jones; Sgt. R. E. Jordan; Sgt. J. Lovelock; Flt. Sgt. A. N. McGlashan; Flt. Sgt. D. G. Morris; Sgt. L. Pezaro; Sgt. A. S. Pilbeam; Sgt. P. Ringroso; Sgt. F. F. Scott; Flt. Sgt. L. G. Slaughter; F/O. R. R. Smart, D.F.C.; P/O. H. S. Spain; Sgt. J. Stock; F/O. A. J. Sumner; F/O. G. A. Tull; Flt. Sgt. P. W. S. Varley; Sgt. A. Waller; F/O. S. Willetts; Sgt. L. D. Wilson.

WOUNDED OR INJURED IN ACTION.—Sgt. J. G. Robinson.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. K. Chiles; Flt. Sgt. H. L. Heason; Sgt. C. V. Plant; Sgt. R. A. W. Roberts.

MISSING.—Sgt. S. Adair; Sgt. P. A. O. Adams; Sgt. H. E. Arbon; Flt. Sgt. K. Archibald; Sgt. D. S. Armstrong; Sgt. B. S. Barber; Sgt. C. Barnes; Sgt. R. E. Barnicoat; Flt. Sgt. R. A. Barringer; Sgt. M. Bass; Act. Flt. Lt. J. P. D. Bartleet; Flt. Lt. H. Bean; W/O. D. M. Beck; Flt. Lt. D. G. Belyea; Sgt. G. E. Benson; F/O. A. H. Birch; Sgt. H. H. Blake; F/O. G. E. Blandford; Sgt. H. Bodger; Sgt. L. H. J. Borley; Sgt. J. A. Boyes; P/O. A. A. A. Bradley; P/O. G. W. Bradshaw; Flt. Sgt. J. T. Broad; W/O. N. Brook; Flt. Sgt. P. Brunton; Sgt. R. H. C. Burgess; Flt. Sgt. J. Burnside, D.F.M.; F/O. R. F. Calderhead; F/O. E. N. Calvert; Sgt. K. L. Cheeseman; Flt. Sgt. J. W. Clarke; Sgt. C. Clay; Act. Sqn. Ldr. A. E. Cook, D.F.C.; F/O. S. Corran; Sgt. L. P. Cundall; Sgt. W. E. Desborough; Sgt. R. Dixon; Sgt. N. W. Doring; Sgt. J. A. Downie; Sgt. D. Englefield; Flt. Sgt. R. S. Evans; Sgt. G. H. Eaton; P/O. R. L. Giblett; Sgt. R. H. Ginn; Sgt. W. Goulding; Sgt. J. Gregory; F/O. J. F. J. Greig; Sgt. D. Gutteridge; Sgt. E. Hankinson; Flt. Lt. A. Hannay; F/O. A. W. Hickling; Sgt. S. W. Higgins;; Sgt. W. F. G. Higgs; W/O. R. L. Hinchcliffe; Flt. Lt. C. Holland; P/O. G. Hood; Sgt. D. W. Hughes; F/O. R. V. Ings; Sgt. F. L. James; W/O. C. A. Jones; Flt. Sgt. H. G. Jones; Sgt. W. K. Jones; Sgt. C. T. Keeling; Flt. Lt. R. D. Langton, Sgt. A. S. Lewis; Sgt. J. W. Lovat; Sgt. R. McG. McLaren; W/O. W. R. Macpherson; Flt. Sgt. D. MacTaggart; Sgt. D. C. Mardling; P/O. W. J. Martyn; Flt. Lt. N. Marwood-Tucker; Sgt. D. C. Matthews; F/O. E. T. Meaker; Sgt. G. E. Milton; Sgt. K. W. Molyneux; F/O. J. E. Morrison; Sgt. E. W. Newton; Sgt. D. R. Northcote; Sgt. H. Ogley; Flt. Sgt. W. R. C. Parfitt; Sgt. T. V. Parsons; Flt. Lt. H. Paston-Williams; Sgt. D. K. J. Phillips; Act. Wing Cdr. E. L. Porter; Sgt. G. H. Postins; Sgt. B. R. J. Pring; P/O. B. A. Pullin; Flt. Lt. S. H. Pyrah; P/O. B. Ramsden; Flt. Sgt. J. M. Reid; Act. Flt. Lt. J. I. Rogerson; Sgt. D. L. J. Rolfe; F/O. D. Rudd; Flt. Sgt. W. H. Scott; P/O. C. C. Scrimshaw; F/O. R. V. Selenyi; P/O. M. Sharp; Sgt. J. K. Slack; F/O. C. C. Smith; W/O. L. H. Smith; Sgt. W. J. Smith; F/O. S. G. Spakowski; Sgt. A. Stewart; Sgt. F. C. A. Stokes; Flt. Sgt. C. E. Stratford; Sgt. J. G. F. Toll; Flt. Lt. E. T. Tunstall; F/O. J. A. Turner; F/O. T. J. R. Turner; Sgt. W. E. Twigg; Sgt. T. M. Twomey; P/O. J. W. Walker; Flt. Sgt. L. R. Watts; Flt. Sgt. J. D. Wells; Sgt. F. C. Williams; Flt. Sgt. R. S. Williams; P/O. W. J. Young.

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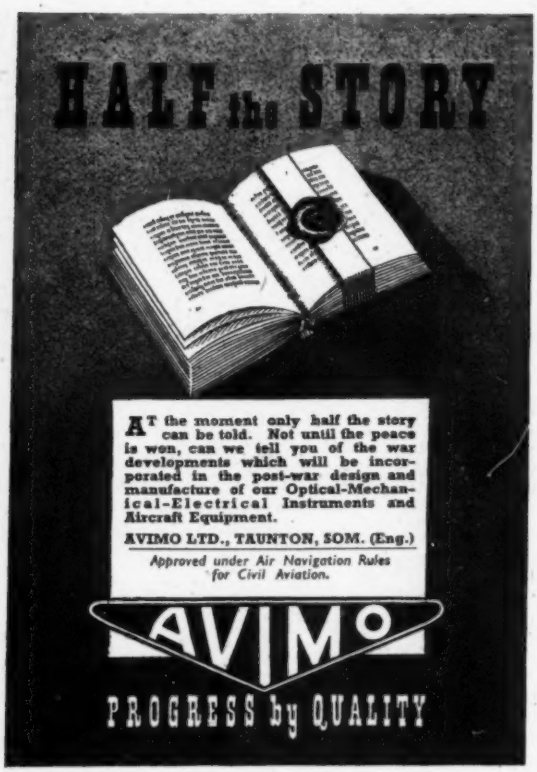
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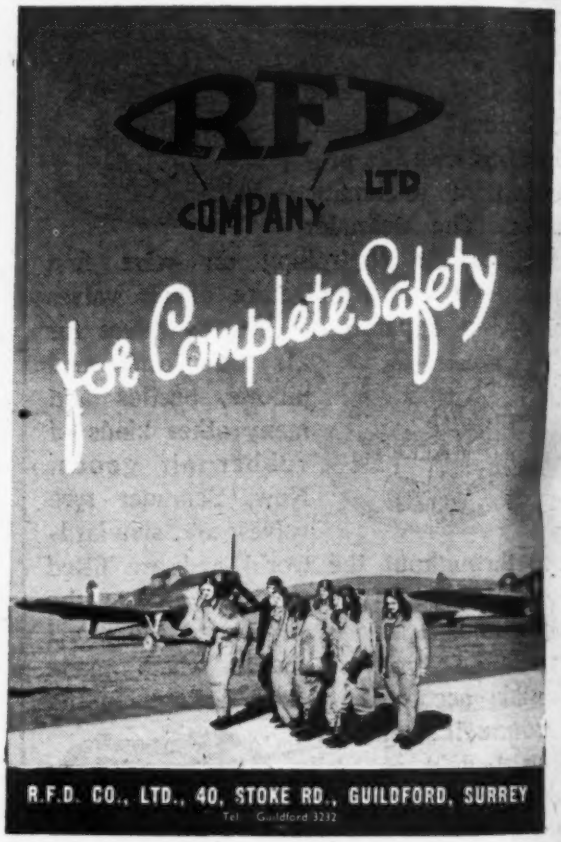

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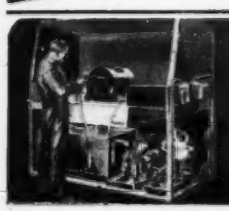

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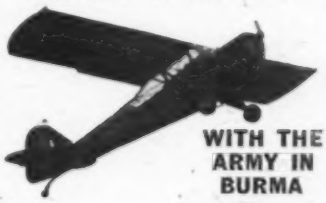

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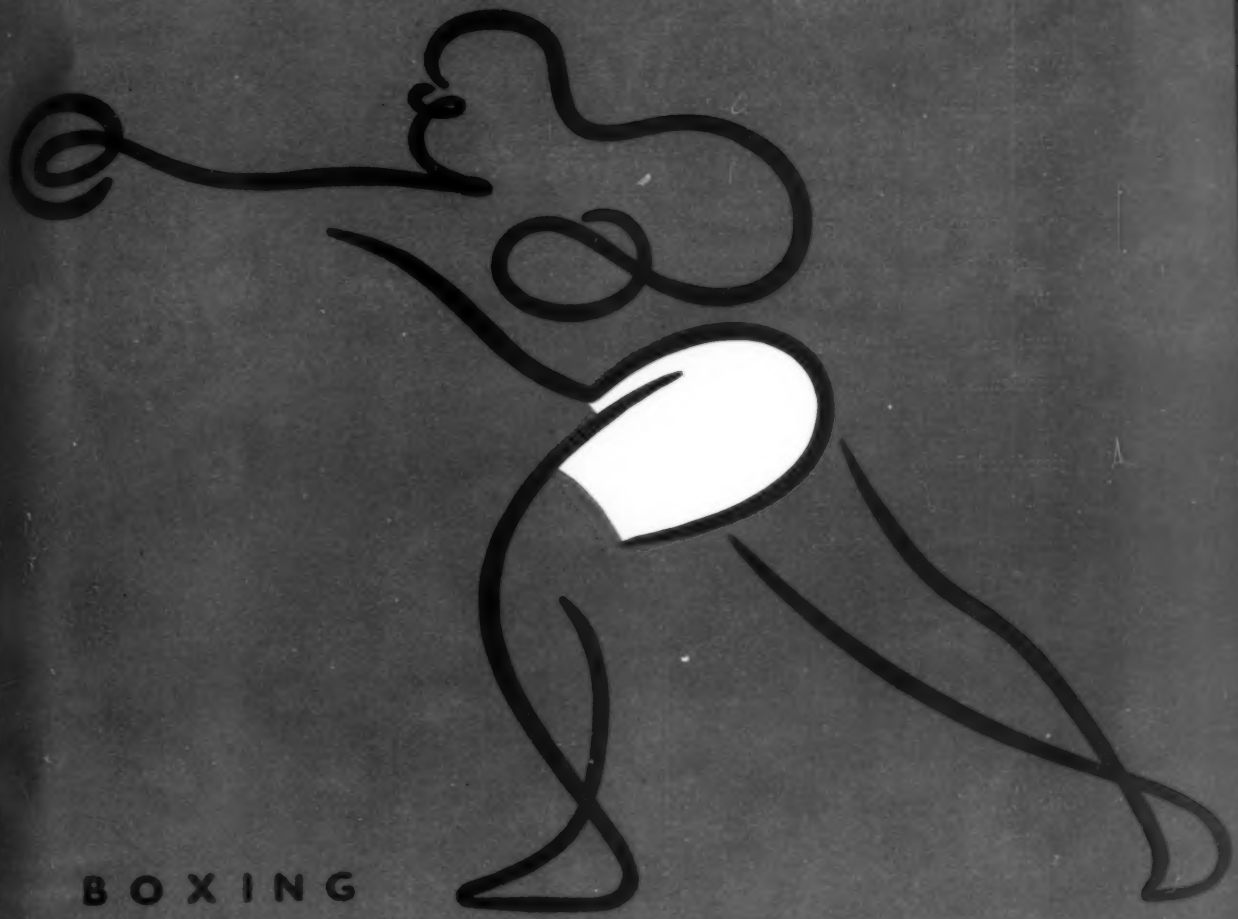

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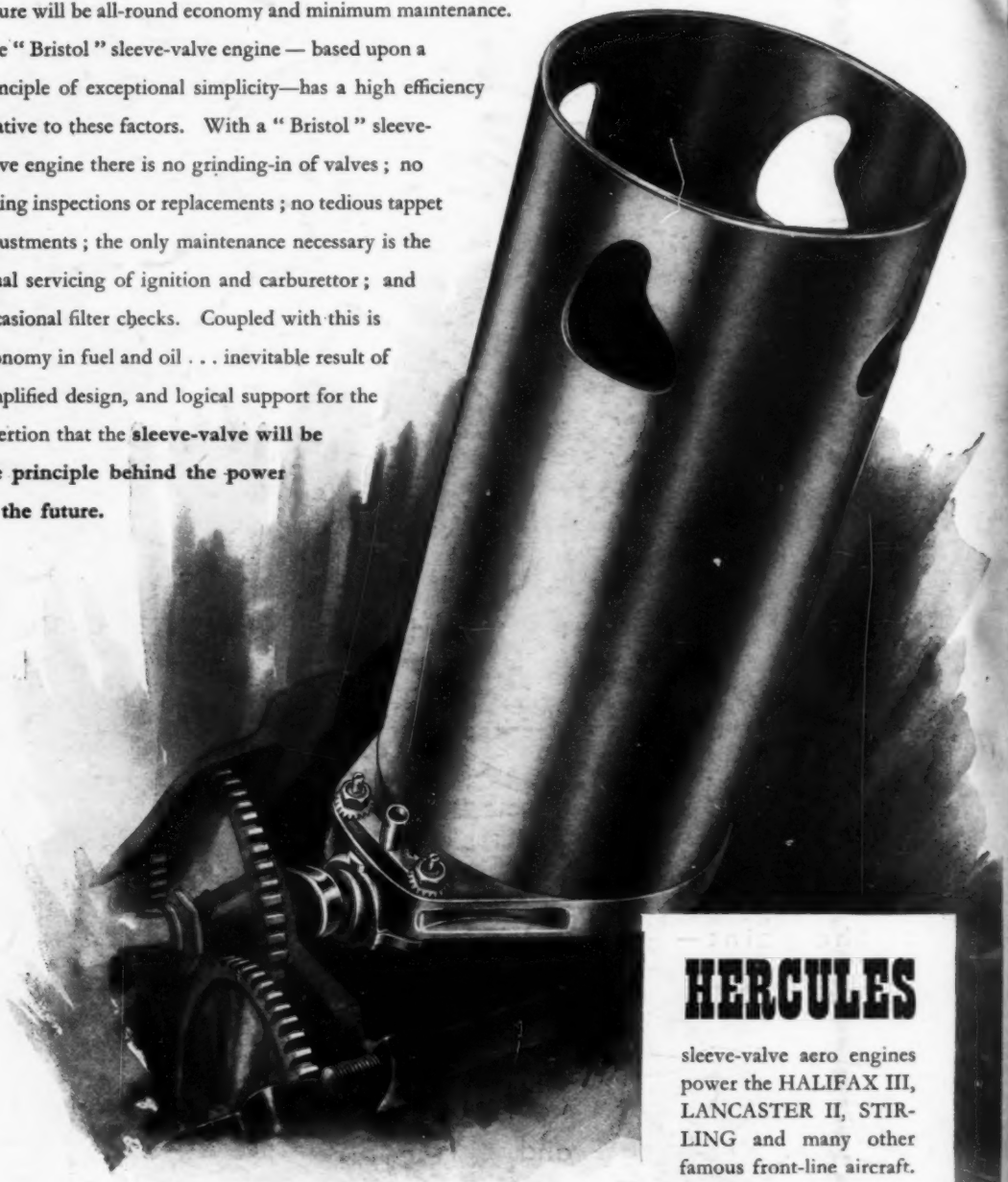

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